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U. S. DEPARTMENT OF AGRICULTURE.

OFFICE OF EXPERIMENT STATIONS—BULLETIN 245.

A. C. TRUE, Director.

COURSE IN THE USE AND PREPARATION
OF VEGETABLE FOODSFOR MOVABLE AND CORRESPONDENCE
SCHOOLS OF AGRICULTURE.

ANNA BARROWS,

*Director, School of Domestic Science, Chautauqua, N. Y., and Instructor,
School of Household Arts, Columbia University.*WASHINGTON:
GOVERNMENT PRINTING OFFICE.

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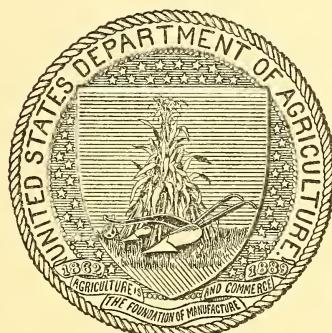
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BY

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OFFICE OF EXPERIMENT STATIONS.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS,
Washington, D. C., October 10, 1911.

SIR: I have the honor to transmit herewith and to recommend for publication as Bulletin 245 of this office a Course in the Use and Preparation of Vegetable Foods, prepared by Miss Anna Barrows, of the School of Household Arts of Columbia University, and director of the School of Domestic Science at Chautauqua, N. Y., and edited under the supervision of C. F. Langworthy, chief of nutrition investigations of this office. It has been the author's purpose to reduce the subject of the preparation of vegetable foods to such pedagogical form that the student may be brought to know in a comparatively brief period not only how food of this character should be prepared, but also be taught the relative value of different vegetable foods and the principles which underlie their rational use.

The series of courses of which this bulletin is one was originally intended for use exclusively in movable schools of agriculture. As extension teaching has developed it has become apparent that the courses ought, if possible, to be made available for a much larger body of students than can be reached by the short-course and movable-school method. In order to do this the form of the present bulletin has been modified from those that have preceded it in this series, with a view to adapting it to use in teaching by correspondence. The changes consist mainly in somewhat greater detail of explanation in the body of the text, the addition of a list of queries following each lecture, and the printing of the lectures separately in the bulletin so that they may be detached and given to the members of the class for reference in their reading and practice work.

Respectfully,

A. C. TRUE, *Director.*

Hon. JAMES WILSON,
Secretary of Agriculture.



CONTENTS.

	<i>Page.</i>
Prefatory note.....	9
General suggestions to teachers.....	13
First lecture—Classification of plants.....	15
Introductory—Relation of economic botany to cookery.....	15
The structure of plants.....	17
Food plants and their composition.....	18
Experiment and practice work, first lecture.....	19
Composition of foods.....	19
Water and mineral matter.....	19
Fat.....	19
Protein.....	19
Starch.....	20
Sugar.....	20
Germination tests with seeds, etc.....	20
Review questions, first lecture.....	20
Second lecture—Leaves and stalks.....	21
Use of raw vegetables.....	21
Experiment and practice work, second lecture.....	24
Lettuce.....	25
Celery.....	25
Cabbage.....	25
Salads and salad dressings.....	25
Review questions, second lecture.....	26
Third lecture—Leaves and stalks—Continued.....	27
Wild plants used as potherbs.....	27
Cultivated potherbs or greens.....	28
Seaweeds.....	30
Experiment and practice work, third lecture.....	31
Preparation and cooking of potherbs and similar vegetables.....	31
Review questions, third lecture.....	32
Fourth lecture—Bulbs.....	33
The onion tribe.....	33
Experiment and practice work, fourth lecture.....	35
Preparation of onions.....	35
Methods of cooking.....	35
Securing onion flavor.....	36
Spanish onion.....	36
Onion and apple salad.....	36
Onion soup without meat.....	37
Fried onions.....	37
Stuffed onions.....	37
Onion custard.....	37
Onion soufflé.....	37
Review questions, fourth lecture.....	37

	Page.
Fifth lecture—Tubers and roots.....	39
White or Irish potatoes.....	39
Sweet potatoes.....	41
Jerusalem artichoke, yam, cassava, and other starch-bearing tubers and roots.....	41
Experiment and practice work, fifth lecture.....	43
Potatoes.....	43
Baked.....	43
Boiled.....	44
Steamed.....	44
Mashed.....	44
Cut and boiled.....	44
Soup.....	44
Salad.....	44
Experiments with starchy materials.....	44
Review questions, fifth lecture.....	44
Sixth lecture—Succulent roots.....	45
Beets.....	45
Turnips.....	45
Kohl-rabi.....	46
Radishes.....	46
Carrots.....	46
Parsnips.....	46
Celeriac.....	46
Salsify.....	47
Condimental roots.....	47
Experiment and practice work, sixth lecture.....	47
Parsnips, salsify, beet, and celeriac.....	47
Carrots.....	48
White sauce for vegetables.....	48
Review questions, sixth lecture.....	48
Seventh lecture—Flowers and fruits.....	49
Flowers and products made from them.....	49
Capers.....	49
Cauliflower.....	49
Globe artichoke.....	49
Honey.....	50
Colors and flavoring extracts.....	50
Fruits used as vegetables.....	51
Pumpkins and squash.....	51
Cucumbers and melons.....	51
Peppers.....	52
Okra.....	52
Eggplant.....	53
Tomato.....	53
Bananas.....	54
Experiment and practice work, seventh lecture.....	54
Review questions, seventh lecture.....	54
Eighth lecture—Seeds.....	55
Beans, peas, and lentils.....	56
Peanuts.....	58
Cottonseed.....	59

	Page.
Eighth lecture—Seeds—Continued.	
Cereal seeds as vegetables	59
Wheat, oats, and rice.....	59
Corn.....	59
Buckwheat.....	60
Experiments and practice work, eighth lecture.....	60
Comparison of fresh, dried, and canned legumes.....	60
Lima beans.....	61
Baked beans.....	61
Cowpeas	61
Review questions, eighth lecture.....	62
Ninth lecture—Fungi.....	63
Mushrooms, etc.....	63
Mildew, molds, and ferments.....	64
Yeast.....	65
Experiment and practice work, ninth lecture	65
Mushrooms.....	65
Mold and decay.....	65
Yeasts and fermentations.....	65
Review questions, ninth lecture.....	66
Tenth lecture—Condimental vegetable foods and food accessories.....	67
Condimental vegetables and prepared relishes.....	67
Flavoring materials.....	68
Herbs.....	68
Spices.....	68
Flavoring extracts.....	68
Beverages.....	69
Tea.....	69
Coffee.....	69
Chocolate and cocoa.....	69
Miscellaneous food accessories.....	69
Experiment and practice work, tenth lecture.....	69
Flavoring materials.....	69
Spices and herbs.....	70
Flavoring extracts.....	70
Beverages.....	70
Tea, coffee, cocoa, and chocolate.....	70
Review questions, tenth lecture.....	70
Eleventh lecture—Summary of cookery.....	71
Choosing, sorting, and cleaning vegetables.....	71
Combinations of vegetables.....	73
Utensils used in cooking vegetables.....	74
Cooking terms.....	74
Time of cooking.....	75
Ways of serving	75
Soups.....	75
Salads.....	75
Scallops.....	75
Fritters.....	75
Croquettes.....	76
Frying.....	76
Experiment and practice work, eleventh lecture.....	76
Review questions, eleventh lecture.....	76

	Page.
Twelfth lecture—Drying, evaporating, and salting vegetables	77
Drying and evaporating foods.....	77
Preserving by salting.....	78
Experiment and practice work, twelfth lecture.....	79
Drying vegetable substances.....	79
Restoring dried foods to their original conditions.....	79
Review questions, twelfth lecture.....	80
Thirteenth lecture—Preserving and canning vegetables.....	81
Preserving with sugar.....	81
Preserving by sterilization—Canning.....	83
Experiment and practice work, thirteenth lecture.....	84
Action of bacteria, molds, etc.....	84
Sugar.....	85
Canning.....	85
Review questions, thirteenth lecture.....	86
Fourteenth lecture—Pickling vegetables.....	87
Vinegar.....	87
Herb vinegars.....	87
Pickles and sauces.....	87
Care of pickled and canned goods.....	88
Experiment and practice work, fourteenth lecture.....	89
Simple pickles.....	89
Combination in pickling	89
Review questions, fourteenth lecture.....	90
Fifteenth lecture—Vegetables for the table: Marketing.....	91
Cultivating vegetables for the table.....	91
Weights and measures.....	92
Trade customs and market conditions.....	92
Growing vegetables for the home table.....	93
Experiment and practice work, fifteenth lecture.....	94
Review questions, fifteenth lecture.....	94
Appendix.....	95
References.....	95
List of apparatus and supplies required	97

PREFATORY NOTE.

The aim of this course is to make available to country people and others not able to attend fixed schools of home economics the main facts connected with the preparation and use of vegetable foods. The effort has been to arrange these facts in such pedagogic form that they may be studied successfully by persons having had little opportunity for instruction along scientific lines. On the other hand, a certain amount of practical acquaintance with domestic art is expected of those registering for study as well as a degree of scholastic acquirement equal to at least the completion of the eighth grade in school. The course is for adults and not for persons of immature age or inexperience.

In the movable-school course as originally contemplated the teacher was expected to be an expert, thoroughly familiar with the subject taught, and able to add to the information given in the printed lessons by drawing from his own resources. He was also expected to be able to conduct the reviews and the periodical and final examinations without the aid of a list of questions other than his own.

Inability to secure a sufficient number of experts of this character and the expense involved has led to the effort to adapt the movable-school courses to correspondence work, the instruction to be initiated and controlled by a central institution. Under the correspondence method the leader directly in charge of the local work may be a layman with perhaps only slight experience in teaching and limited information along scientific lines. The main business of this leader is to see that the work required of each student is performed as outlined in the printed course. He is also in charge of the apparatus and material for laboratory work and has oversight and direction of all the operations prescribed for performance by the students.

Experience has demonstrated that study by isolated individuals under the old correspondence method is impracticable except in instances too few to be regarded in a system that is to be effective in reaching the masses. The organization of students, therefore, into classes is essential in correspondence work. The leader preferably should be a resident of the neighborhood in which the class is organized. This class leader must be approved and appointed by the head

of the extension department, and when appointed becomes the official representative of that department and is held responsible for all apparatus, books, and material furnished to the class by the institution under whose auspices the correspondence course is conducted. He conducts the quiz on the previous day's lesson, using the printed questions; presents the lesson of the day by reading the printed outline before the class; assists the students in their reference work and oversees the practicums. He keeps a record of attendance, requires and receives the examination papers of the members, and submits them, together with his report upon the week's work, to the chief of the extension department at the central institution.

The correspondence course is intended to be organized and conducted under the oversight of the agricultural-extension department of the agricultural college or experiment station. In organizing the class a representative of this extension department should visit the community, select the leader, list the names of those who wish to join, assist in securing proper rooms in which the class exercises are to be conducted, and make out the order on the college or experiment station for the material needed in conducting the course.

Apparatus and supplies for the class are to be furnished by the extension department sufficient to provide each student with a complete set for his individual use during the course. Each student is to be charged in an itemized account with the apparatus and material committed to him, the money to be refunded at the close of the school period, less 10 per cent, and the cost of material consumed or broken.

The expenses connected with securing a hall, providing janitor service, water, light, heat, seating, and all incidentals are to be met by the locality in which the class is held. Each member is required to pay a registration fee, in addition to the fee for apparatus and supplies. This registration fee is to be an amount sufficient to meet the salary of the leader of the class, and such minor incidental expenses as may be necessary. At the close of each week an examination upon the lectures of the week is to be written up by each student upon blanks provided by the extension department, to be transmitted through the leader of the class to the chief of the extension department for inspection and rating. At the completion of the course an examination upon the entire course will be conducted by a representative of the extension department who visits the community and conducts the examination exercises. To all who complete the course and pass the examination satisfactorily a certificate of the fact is made out and given to the student by the institution under whose auspices the course is conducted. This certificate entitles the holder to credits for entrance in case he should desire to become a resident student.

The course is a "study course" and not a set of lectures to be received without subsequent effort on the part of the students. By it they are shown where to get information. They are then expected to look up the references for themselves and apply the teachings. The leader is to see that the study is performed by each student, that the references are consulted and tested by laboratory methods, and that the examination papers are made out and forwarded regularly to the extension department responsible for the course.

The bulletin is so printed and bound that the lectures may be detached and given to the students of the class as each is delivered, thus avoiding the necessity for taking notes, and providing also a reference list for reading and for laboratory use.

Classes in correspondence study can be organized with little effort and to a great advantage by granges, farm clubs, young peoples' institutes, county farmers' institutes, high schools in vacation periods, and by county fair associations.

Instructions giving detailed information respecting the use of this and the other courses in correspondence work have been prepared and can be had upon application to the farmers' institute division of the Office of Experiment Stations.

JOHN HAMILTON,
Farmers' Institute Specialist.

COURSE IN VEGETABLE FOODS FOR MOVABLE AND CORRESPONDENCE SCHOOLS.

GENERAL SUGGESTIONS TO TEACHERS.

It is desirable that the student should know in advance of entering the class something of the structure of plants and of the vital processes that go on within them. Some knowledge also of the chemical composition of food plants is necessary if the study is to be pursued to the best advantage, and he should have some information as to the functions of the digestive organs of the body and of the material needed for its sustenance and some understanding of the changes that food undergoes in its assimilation. It may be well for the teacher at the outset to utilize two or three of the lecture periods in giving information and in directing the reading along these lines.

It is not essential that the lessons be given in the precise order in which they are here presented. It may be found advisable to change the order to meet local conditions. In some instances also the practice exercises are more than can be accomplished in a single period. In such case they can be continued and completed later.

When the course is used in correspondence teaching and the leader is not a thoroughly trained expert the class will necessarily be dependent almost wholly upon the printed text, the reference readings, and the practice exercises for instruction. The leader, however, is expected to study the course in advance of the students and be able to answer such questions as the particular lesson being studied suggests.

The queries at the end of each exercise are intended to aid in fixing the leading points in the students' minds, and the weekly examinations, to be sent in to the correspondence department for criticism and correction, give opportunity for that department to keep informed as to the quality of the work. The majority of the questions have to do with facts brought out in the lessons, but some of them refer to matters which the student is expected to gather from the supplementary reading suggested. The final examination by a member of the extension department will determine the grade of each member of the class.

Each lesson is to be followed by reference reading by the students, and later by practice exercises or laboratory work. The books referred to in the lectures constitute the library of reference. Apparatus sufficient to furnish each student with a set for use in practice work is supplied at a nominal rental by the department conducting the course.

COURSE IN VEGETABLE FOODS.

FIRST LECTURE—CLASSIFICATION OF PLANTS.

INTRODUCTORY—RELATION OF ECONOMIC BOTANY TO COOKERY.

A great variety of food plants are included under the term "vegetables," and there are many matters connected with their growth, selection, and preparation as human foods that are important in a study of their economic value and use.

Their study may be conducted along a variety of lines, depending upon the use to which the information sought is intended to be applied. They may be studied with reference to—

- (1) Their discovery and improvement by man.
- (2) Their classification by botanists.
- (3) The parts of each plant desirable for food.
- (4) Their chemical composition and food value.
- (5) The commercial conditions of their transmission from producer to consumer.
- (6) The culinary processes through which they must pass before they can be properly utilized by the human body as food.

This course of study is more particularly along the line of the sixth item in this list—the culinary processes through which vegetables must pass before they can be properly utilized by the human body as food.

Few of the vegetables which are now man's main dependence were attractive in their original form, but most have been evolved through centuries of cultivation and experiment. (Reference No. 90, pp. 9-30.) Cookery as well as agriculture has served to increase the number of plants available for food. "The number of inhabitants that can be supported in a country depends as much upon the art of cookery as upon that of agriculture; both arts belong to civilization," said Count Rumford, a pioneer in scientific food study.

Primitive man gave little thought to agriculture, but took seeds, fruits, roots, leaves, and stalks, or fish and game, as nature provided them, thus satisfying his hunger and getting such variety as he could. In the division of labor between the sexes in early times the men were usually the hunters, and the women gathered, transported, and stored the simple forms of vegetable foods, including fruits and nuts, roots and seeds. (Reference No. 90, pp. 9-30, 67.)

The evolution of the use of plant products as food has been described as follows (Reference No. 90, p. 15) :

In her exploitation of the vegetable world, woman first appears as taking from the hands of nature those fruits and other parts of the plants that were ready for consumption without further preparation. On the next journey she ventured a step farther. With digging stick and carrying basket she went to search out roots and such other parts of plants as might be prepared for consumption by roasting or perhaps by boiling with hot stones. On her third journey she gathered seeds of all kinds, but especially the seeds of grasses, which at her hand were to undergo a multitude of transformations. Wherever tribes of mankind have gone women have found out by and by that great staple productions were to be their chief reliance. In Polynesia it is taro and bread-fruit. In Africa it is palm and tapioca, millet and yams. In Asia it is rice, in Europe the cereals, and in America corn and potatoes, and acorns or piñons in some places. The whole industrial life of women is built up around these staples. From the first journey on foot to procure the raw material until the food is served and eaten, there is a line of trades that are continuous and are born of the environment.

The occupations necessarily grouped around any vegetal industry are the gathering of the plant or the parts to be utilized, the transportation of the harvest from the field to the place of storage, the activities necessary to change a raw foodstuff into an elaborated product, and lastly, the cooking and serving of the meal. It may be stated with much certitude, though there are noteworthy exceptions, that all of these processes in savagery were the function of women, and in their performance she includes within herself a multitude of callings, some of which now belong largely to men.

To trace the common vegetables back to their sources from our times through past ages by aid of literature and history would be an interesting task.

The possibilities of the agriculturists and cooks of the future are seen when we learn that of the more than 100,000 species of flowering plants now known, only about 300 species are yet cultivated to any extent, and some of these have been used for thousands of years. (Reference No. 67, Vol. II, p. 3.) The enormous possibilities of securing new and valuable plants by crossing and breeding should also be remembered. Yet large markets offer hardly 50 varieties of vegetables, and most families use less than half this number.

There are many ways of classifying the plants which are useful to man (Reference Nos. 18, pp. 6, 7; 64, p. 120; 69, pp. 289-291; 91, p. 241); a simple plan is to divide them according to their uses into—

- (1) Those that yield food for man, or for those animals which in turn serve as food for man;
- (2) Those which furnish materials for clothing and shelter; and
- (3) Those which supply no material need, but add beauty to human surroundings.

For accurate designation of plants the Latin form of names are used, and some familiarity with these is necessary in studying this subject or even for reference to the dictionaries and encyclopædias.

The majority of the plants mentioned in these lessons belong to the following families. Familiar examples are given after the name of each group. (Reference No. 67, Vol. II, p. 2.)

Chenopodiaceæ: Beets and spinach.

Compositæ or composite family: Jerusalem artichoke.

Cruciferæ or mustard family: Mustard and cabbage.

Cucurbitaceæ or gourd family: Squash and cucumber.

Gramineæ or grass family: Indian corn, rice, and wheat.

Leguminosæ or pulse family: Beans and peas.

Liliaceæ or lily family: Onions and leek.

Solanaceæ or nightshade family: Potato and tomato.

Umbelliferae or parsley family: Carrot and parsnip.

THE STRUCTURE OF PLANTS.

Every plant may be considered a factory into which are carried substances from the air and the earth to be manufactured into other and very different products. In general, the processes which go on within the plants are those of upbuilding, the substances which enter being very simple and the majority of those which are produced being complex.¹

In accordance with the classification on page 16, some plants may be considered factories for the manufacture of food, others factories for the manufacture of textile fibers, while still others may be considered factories for the manufacture of fuel or building materials. Some serve several or all of these purposes. But whatever may be the use to which the plants are put, they all have certain characteristics in common which may be learned from any work on botany. (Reference Nos. 79; 81, pp. 50-53; 85, pp. 105, 144-153.)

In studying plants in general we learn that they have a framework of a substance which is known as cellulose and that this cellulose frequently surrounds other materials in the plant. It gives to some plant tissues such tenacity that they may be used for textiles. In those plants or parts of plants which are used for fuel, wood, for example, it is the chief source of heat. (Reference Nos. 65, pp. 20-30; 92.) It is, however, acted upon with difficulty by most chemical reagents and it can be digested in appreciable amounts by human beings only when it is very young. In approaching the study of food plants, therefore, we need to be made familiar not only with those plant materials which can be utilized for food but also with this other substance, cellulose, which is invariably present. (Reference No. 83, p. 94.)

¹ The general structure of the plant may be shown under the microscope, or when that is not available, by pictures or lantern slides. (Reference No. 67, Vol. II, pp. 11-21.)

FOOD PLANTS AND THEIR COMPOSITION.

Within the network of cellulose which is to be found in all plants most of the nutritious materials of the food plants are deposited. Since the cellulose is not digested except when very young, it is usually necessary to soften it in some way so as to prevent its interference with the digestion of other substances. This is usually done by heat, but to accomplish it water must be present. Sometimes there is sufficient water in the vegetable itself. The potato, for example, is three-fourths water; even when a potato is baked, therefore, its starch and other ingredients are heated in water. If the vegetable has been dried, it is necessary to soak it in water before cooking it.

Though the greater part of the cellulose of vegetable foods remains undigested, it plays an important part in the digestion of other nutrients. These other nutrients are gradually rendered soluble by the digestive juices and are absorbed. If it were not, therefore, for the presence of cellulose, the bulk of the food in the alimentary canal would become so small as to make its passage through the canal difficult. This is the reason why it is so frequently said that cellulose is useful chiefly to give bulk to the food.

Most foods include more or less refuse as well as the edible portion. Modern commercial enterprise separates much of the refuse before delivering foods to the consumer.¹ The edible portion consists of water and four types of nutrients. (Reference Nos. 7, pp. 11-14; 34, pp. 12-13, 17.)

Water.—This substance, essential to life, is present in almost all foods, but in varying proportions. Even the dry cereals and other seeds contain 10 per cent or more. Watery juice is often apparent to the sight or touch or will be yielded from many fresh vegetables by pressure. Dry seeds must be soaked or cooked in water before they are fit for food.

Mineral matter.—In most vegetables the percentage of ash is higher than in grains. When one notes the small bit of ash remaining after food is burned and considers that ash contains calcium, iron, potassium, sulphur, etc., one realizes how small an amount of each must be present. Still, these minute quantities, often, in all, barely 1 per cent of the total weight of the food, are essential to health. Such materials are considered much more efficacious when taken into the body in this form than in "spring medicines." (Reference Nos. 33 and 36.)

Fat.—Comparatively few common vegetables contain enough fat to have it show readily. Nuts, such as pecans and coconuts and seeds, such as cottonseed, peanuts (a beanlike seed commonly called

¹ In every lesson attention may be directed to the small percentage of each plant which is useful as food.

a nut), sesame, mustard, and corn, and such fruits as the olive and avocado, or alligator pear, may yield a considerable amount. The lack of fats in most vegetables justifies the habit of using cream, butter, meat fats, or olive oil with them, as is generally done.

Protein.—Except in legumes there is too little protein, as the total nitrogenous material is called, in vegetables to be detected by simple experiments. From the point of view of dietetics this is not significant, for vegetables are commonly eaten with meat and milk products which supply protein and fat.

Carbohydrates.—As a class vegetables are rich in carbohydrates. Starch, cellulose, and sugar are usually all present. Though the amount of sugar is usually small it is apparent in the sweet taste of squash, young peas, and green corn. (Reference Nos. 34, p. 25; 81, pp. 53-57.)

EXPERIMENT AND PRACTICE WORK, FIRST LECTURE.

Materials needed.—Test tubes, paper, cheesecloth, wire strainer, filter paper, alcohol lamp or Bunsen burner; a few each of large seeds such as corn, squash, beans, peas, nuts; ripe olives; onions and other bulbs; potatoes, beets, carrots, and piece of squash; small quantities of iodin, ether, nitric acid.

Composition of Foods.

Water and mineral matter.—Weigh a small portion of a vegetable, slice thin or grate it, and spread on a shallow dish and set in the oven with the door open or on the back of the stove, or put the sections in the upper part of a double boiler and leave uncovered, or spread in the sunlight in a current of air. Weigh after 1 hour and again after 24 hours. Also soak dried fruit or vegetables, measuring and weighing before and after soaking and estimating percentage of water absorbed. Burn any vegetable substance on a clean surface which can be made very hot; the ash left after all charcoal disappears is the mineral matter. Small tin covers are convenient for this purpose.

Weigh a potato; bake it, and weigh again after baking; put in the oven and allow it to turn to charcoal, and weigh again; then burn the charcoal in a crucible and weigh the ash, and compare approximately with the original weight of the potato.

Fat.—Crush nuts or bruise ripe olives or mustard seeds on blotting paper.

Put some peanut butter in a piece of cheesecloth and leave in the oven or in a water bottle until the warm oil separates.

If an equal volume of ether is added to ground flaxseed or peanuts and allowed to stand a short time, 10 minutes or more, the fat is dissolved with the ether. It may then be filtered and the liquid left in a draft of air until the ether evaporates and the fat remains. Great care must be exercised in the use of ether, as it is very volatile and inflammable. Do not use it near a fire or lighted lamp.

Protein.—Heat split peas in the water in which they have soaked for 24 hours or more. Gather the white froth which rises and test that and some of the water with dilute nitric acid. Such substances become yellow when the nitric acid is added and the whole is heated. Treat some egg white or milk in the same way for comparison.

A still simpler though less certain test for protein or albuminous substances is the unpleasant smell given off by all materials containing them when burned. Burned milk or eggs have a well-known odor, and plants or seeds, such as beans and peas, burn with much the same smell.

Starch.—From ground peas or beans or grated potato starch may be washed out as from flour, through a coarse cloth or fine wire strainer. This may be dried and compared with commercial starch or cooked and tested with iodin. (Reference Nos. 34, p. 25; 81, pp. 53-57.) See also experiments under Lesson 5, page 43. (Reference Nos. 71, pp. 54, 59, 62; 72, pp. 60-62, 236, 237.)

Sugar.—Evaporate water in which carrots, beets, or squash have been boiled. Test it by tasting when it becomes a thick sirup.

Evaporate further until it burns and compare the odor with the result from burning sugar.

Germination Tests with Seeds, etc.

(Reference No. 79, chap. 1.)

Have some squash seed soaked for 24 hours or longer. Plant some of them and examine one or more each succeeding lesson. Split open some of the soaked seeds and find the seed leaves and embryo plant. Soak other seeds and compare with the first ones after the leaves begin to unfurl.

Try similar experiments with other large seeds, like peas or kidney or Lima beans. (Reference No. 99.)

In the same manner experiment with sprouting potatoes or onions. These may be put in earth or in a glass of water or even wrapped in moist cloth or paper. Notice the changes from day to day and the gradual shrinking of tuber or bulb as the sprouts develop; estimate loss of substance. Keep some away from the light and others in bright sunshine.

Cut the green top from a carrot and put the cut surface in a glass of water and place in the sunlight and in a few days small leaves will appear.

Another interesting experiment is the extraction of chlorophyll. (Reference No. 80, p. 287.)

Chop raw spinach fine, press in a cloth, then heat the juice extracted. Dip or strain the extract from the water and combine with sugar to preserve it. The green coloring matter thus obtained may be reserved for tinting candies and ice cream. If cooked too long it loses its vivid green.

REVIEW QUESTIONS, FIRST LECTURE.

1. Give different methods of classifying plants.
2. Mention five of the principal plant families and some members of each.
3. Describe the structure of some typical plant.
4. What is cellulose? What of its food value?
5. What proportion of average plants is utilized for food? Give examples.
6. Report your personal observation and experiments in the germination of plants.
7. Describe the principal nutritive substances derived from plants.
8. How may the presence of each one of these substances be recognized?
9. Tell something of the source and changes produced by cultivation of three plant foods.
10. What part has women had in the development of such foods?

[Vegetable Foods, Bul. 245.]

COURSE IN VEGETABLE FOODS.

SECOND LECTURE—LEAVES AND STALKS.

USE OF RAW VEGETABLES.

It seems logical to begin our study with plants or parts of plants that may be eaten raw. Fresh, green vegetables are generally relished and form a part of the diet wherever they can be obtained, and many of those which are most prized are eaten without cooking, as they were by primitive man. Such vegetables may be called salad plants, though it is difficult to classify plants according to the uses to which they are put, for almost all are used for many different purposes. Lettuce, for example, a vegetable which in this country is most always eaten raw, in Europe is often cooked, and thus it becomes a potherb as well as a salad plant. Water cress, though often used as a salad, is sometimes used simply as a condiment. Peas, beans, potatoes, and vegetables such as spinach, which are most commonly served as a "vegetable," are often put into salads. In spite of these difficulties in the way of classification, we may include under salad plants those whose leaves and stems are usually eaten raw with a sour dressing, and define a salad as a dish consisting in whole or in part of vegetables, either raw or cooked, mixed with a sour dressing. Salad dressing usually contains a fat as well as an acid.

The use and cultivation of salad plants go far back into ancient history. These foods are valuable not only because their freshness and attractive appearance arouse an appetite for the more substantial materials served with them, but because in this shape we get all their mineral constituents, which are liable to be lost in part or perhaps rendered less useful by cooking. Hence the desire for such foods should be considered to represent a real need, and raw salad plants should be supplied freely in all dietaries. "Spring bitters," on which the housewives of earlier days set so much store, are more palatable when obtained from salads than from medicine bottles; and, setting aside any question of medicinal value and all that pertains to it, such plants without any doubt help to make the diet attractive and to give a relish to food, particularly in the spring, when one is weary of the limited variety of winter foods.

Housekeepers often claim to know and care little about salads, but those who dig wild Jerusalem artichokes in the spring or start the early peppergrass or radish to serve as relishes at the table are pro-

viding salads for their families; or again, those who prepare the cold vegetables left at noon, such as "greens," with a dressing even of salt and vinegar for supper, make salads. Fresh cucumbers with vinegar or other dressing are salads just as much as are the more elaborate dishes. The derivation of the word salad shows it to mean a food to be eaten with salt.

It would be better to keep near to this original meaning rather than to go to the extreme of some housekeepers who, in their search for novelties for their tables, build up salads from strange combinations in ornate forms.

The distinctive salad plants are very succulent; that is, they consist mainly of water. Hence, they are especially refreshing in warm weather. As a separate course they are a pleasant contrast to the heavier dishes of a formal meal. They also serve to prevent too great concentration of food, and thus aid in the digestive process. Upon the valuable saline properties of these raw plants we are just beginning to place a definite value, though evidently these were recognized by the instinct of the people of the far past. (Reference Nos. 33 and 36.)

Fat is a compact food and, weight for weight, is about two and a quarter times as valuable as protein or carbohydrate for fuel in the human body. (Reference No. 7, p. 12.) A tablespoonful of oil would go farther toward supplying energy for keeping the human machinery running than a large head of lettuce. Over all the world people have instinctively added a condensed dressing consisting mainly of oil, bacon fat, or cream to the salad plants bulky with cellular tissue and water, and have eaten such salads with meat and bread supplying protein and carbohydrate, and thus have secured a fairly balanced ration.

The use of salad plants and salads as decorations on the dining table deserves consideration. Beware of unattractive combinations of color, however, such as beet with tomato, etc. (Reference Nos. 84, ch. 28; 93.)

Modern study of bacteriology indicates that pagan and religious ceremonies of purification by fire and water had definite value for healthful life in this world. Water cleanses to some extent, but only through intense or long-continued heat is complete sterilization and freedom from bacteria and parasites secured. Therefore great care is needed in the selection and preparation of foods which are not to be subjected to heat. Cress, lettuce, and other salad plants, carelessly cultivated and handled in the market and half cleaned in the kitchen, may transmit disease, as may milk, raw oysters, and other animal foods. (Reference Nos. 28, pp. 1-13; 61, p. 115; 97, p. 284.)

The fashion of cutting across a head of lettuce or celery, though it may give each person a fair share of the choice and less tender por-

tions, can not be recommended, because it is practically impossible to cleanse the ax'sls of the leaves, the grooves where they join the stem. All such plants should be separated in their natural divisions and washed in more than one water, individual attention being given to hollows in stalks or leaves. Sand is unpleasant, but less harmful than other things that may be left behind after washing; its presence, however, justifies the suspicion that the washing was not thorough or carefully done. Vegetables such as spinach, which are difficult to free from grit, should be washed in a number of waters, and lifted out of the pan each time in loose handfuls before the water has been drained off. In this way the sand and grit has an opportunity to sink to the bottom of the pan and can be rinsed out. If the water is poured from the pan while the vegetables are in it, part of the sand at least is again distributed over the washed leaves.

Green vegetables should always be looked over carefully to make sure that any inferior portions, insects, or other things which are undesirable are removed. The quality of vegetables may be greatly injured by insect pests and plant diseases. If the plant suffers very severely from such enemies, it can not make normal growth, and so all or parts of it may be inferior. For instance, green peas or string beans from vines badly attacked by insects or by some fungus disease do not attain full perfection. Obviously, leaves used as greens are of inferior quality if worm-eaten. Insect pests and plant diseases can often be controlled by the use of insecticides and in similar ways. (Reference No. 55.) If such things are used there is all the more reason for washing vegetables thoroughly before preparing them for the table, to remove any hellebore, copper salts, or other substance used in treating the plant, which may adhere to it. Salt in the water will aid in drawing out parasites if they happen to be present. There is distinct advantage in washing all salad plants in running water, especially for the removal of insects from lettuce. After washing several times and removing imperfections, salad plants may be kept in a cool place like a cellar or refrigerator for some hours or even a day before using. After draining off the last water, wrap the leaves or stalks in a cloth or put in a clean paper bag; this is more effective than keeping them in water. (Reference No. 28, p. 39.)

During the cleaning process it is advisable to sort out the coarsest portions to add to soup materials; the next best may not be attractive to serve by themselves, but can be cut or shredded for combination with other materials, while the best of all—the heart of the cabbage, celery, or lettuce—should be served in the least elaborate way with salt or a simple dressing.

No plan for serving salads should be encouraged which leads to a waste of food material. If it is desired to use the outer portion of a cabbage for a salad bowl (Reference No. 70, p. 293), any adhering

dressing may afterwards be washed off and the cabbage used for a scallop or soup. The outer leaves of lettuce may be cooked for greens or soup.

Many materials may be combined with the cabbage, celery, and lettuce—raw apples, radishes, or even canned fruit, such as pears cut in slices or cubes. Lettuce is generally recognized in this country as the main dependence for salad by itself and in combination with other foods. There are many varieties, adapted to different conditions, but all may be classed under two general heads—the cabbage lettuce, where the heads are solid and compact, and the cos lettuce, where the leaves are long and loose and less delicate than those of the other type. Romaine is an example of cos lettuce. There are also varieties with blanched centers and curly varieties with dark-tinged leaves.

Chicory may be cultivated for salad, and is more desirable when blanched. Endive, which is very nearly related to chicory, is another useful salad plant. The corn salad or lamb's lettuce is a small plant often found in city markets. Sorrel, wild and cultivated, some young and tender seaweeds, and many mild-flavored plants or weeds may be used as raw salads. Others are better for partial cooking, even if served cold as salads. (Reference Nos. 18, p. 33; 73, p. 151.)

Celery in its wild state is an unpromising if not harmful vegetable; by cultivation, and especially by blanching its leafstalks, it has been made a popular salad plant, and has been thought to have certain medicinal virtues. The fibrous outer stalks and larger white leaves of a bunch of celery should be reserved for soup making. Some of the larger stalks, too stringy to serve whole, may be used in salads if cut in quarter-inch slices, or if too tough for that, may be cooked after cutting and added to soups or served with white sauce or toast. The tender inner stalks should be served plain to eat with salt. Sometimes the groove in the stalk is filled with prepared cheese. The center of the root is a delicate morsel. Leaves and root may be dried to flavor future soups. (Reference No. 20.)

EXPERIMENT AND PRACTICE WORK, SECOND LECTURE.

Materials needed.—Any available salad plants, such as chicory, chives, endive, escarole, mustard, parsley, peppergrass, radish, romaine, water cress, as many types as possible. If only lettuce or celery can be secured, have one root for each pupil. Cabbage, apples, cucumbers, etc., may also be used. For salad dressings provide olive oil, sour cream, peanut butter, eggs, bacon fat, lemon juice, vinegar, and other seasoning materials, according to the recipes to be chosen from those at the end of this section.

Excursion.—If feasible, visit markets, farms, or gardens, or gather wild plants. Learn to recognize different kinds and test their merits as raw foods, alone or with various dressings. At the same time secure other plants to illustrate this and the following lesson.

[Vegetable Foods, Bul. 245.]

Lettuce.

Weigh head of lettuce with the roots and all, if possible. Remove inedible portions and weigh again. Divide into lots, according to quality; weigh or estimate the percentage of refuse and relative values of each portion. (Reference Nos. 7, p. 11; 30.) Estimate cost per calorie. Pull apart and wash each section thoroughly, dry on a cloth without bruising, then arrange the lettuce in a salad bowl as nearly as possible as it grew, the larger perfect leaves outside and the tender ones in the center. Imperfect leaves when not decayed may be rolled or folded and cut in shreds or ribbons for other salads.

Celery.

In the same way clean, weigh, or estimate values of all parts of celery, including the root. Reserve for use in soup stock in some succeeding lesson (5 or 11) tough stalks and portions of the root and coarser white leaves. The tough outer fiber sometimes may be pulled or scraped off. For fringed celery see Reference Nos. 75, p. 120; 76, p. 35. Sort celery like lettuce, reserving tenderest portions to serve in simplest form. If there are enough of the tender white leaves, cut them for greens. The coarse, bright-green leaves have stronger flavor. Cut the coarser stalks across the grain in quarter-inch slices. A large stalk first may be cut in several strips. Let these stand in a French dressing for an hour or more, then combine with other material or fill into a hollowed apple or tomato to serve to each individual. Sections of cabbage or cucumber may be used in this way when celery is not available.

Cabbage.

Cut a portion of the stem from a cabbage, put the cabbage in a dish of water, and cover with a cloth. In 24 hours it will be much crisper, having absorbed water like any withered plant. Take a small light-weight cabbage, turn back the leaves, and compare with a head of lettuce. Compare with a cabbage of similar size, but weighing twice as much as the first. Cut a cabbage in quarters, take out the inner third of each section and serve as a salad. Sometimes the inner cabbage leaves are tender enough to serve whole like lettuce, but usually they should be shaved with a knife or vegetable cutter or chopped. The coarser outer cabbage leaves may be reserved for the succeeding lessons, for soup, or scalloped cabbage.

Salads and Salad Dressings.

(Reference Nos. 18, p. 23; 69, pp. 309-314; 73, pp. 100-103; 76, p. 350; 93.)

Various salad dressings may be made in this lesson and some reserved in glass jars for future lessons. The cooked dressings may be taken up later. In this lesson prepare the simplest types, like the following:

French dressing: To each tablespoonful of olive oil add a few grains of pepper and a little salt, blend thoroughly, and then add slowly one teaspoonful of lemon juice or vinegar. Cottonseed oil may be used in the same way.

Nut dressing: Dilute peanut or other nut butter with lemon juice and vinegar and a little water. Season with salt and pepper.

Cream dressing: Beat thick cream, sweet or sour, with an egg beater until stiff. Season with salt, pepper, and lemon juice or vinegar. Continue the beating while gradually adding the acid.

[Vegetable Foods, Bul. 245.]

REVIEW QUESTIONS, SECOND LECTURE.

1. Mention five plants commonly eaten raw.
2. What of the possible medicinal value of raw foods of this kind?
3. What food materials are most abundant in salad plants? What do they lack?
4. Mention special characteristics and describe the preparation of three of the most common salad plants.
5. Give reasons for special attention to cleansing such materials.
6. How may these leaves and stalks be kept in good condition for the table from one day to another?
7. Why are oils or other fats usually combined with such plant foods?
8. Give directions for dressing a salad with olive oil.
9. What are the usual ingredients in a cooked salad dressing? Give reason for the use of each.
10. Of what value are the decorative possibilities of a salad?

[Vegetable Foods, Bul. 245.]

COURSE IN VEGETABLE FOODS.

THIRD LECTURE—LEAVES AND STALKS—Continued.

Closely associated with the plants that are eaten raw are a host of leaves and stalks commonly cooked and served under the general name "potherbs" or "greens." This old term indicates the instinct of primitive people to seize upon the first green tips that appear in the spring for food. These must have been very welcome after the winter struggle for game, grains, roots, and nuts, if indeed the nomad tribes were fortunate enough to have so much. Notwithstanding the low fuel value of such foods the discerning housewife, even when dependent upon the high prices of city markets, recognizes the necessity of supplying her family bountifully with this type of food in the early spring. A wide variety of plants are usable in this way. Many wild ones are available, and some are cultivated especially for this purpose. Others are by-products; for example, the small beet plants which are thinned out in the home garden.

WILD PLANTS USED AS POTHERBS.

A double purpose may be accomplished in the country home by the use of such wild greens, namely, freeing the grounds from weeds and providing food. Among the wild plants which have been used in this way are the following:

The common dandelion is cut close to the ground before the flower bud has expanded. When it is desired to root out the plant from a lawn, the entire root must be dug up; if simply the top is cut off, the dandelion grows again and in a larger head. The slightly bitter flavor is not disagreeable. The roots furnish a bitter extract often used medicinally, particularly in the domestic medicine of early times. When cultivated, the dandelion is milder and more tender, and may be used as salad, as may the very young wild plant, or dandelions blanched by covering them for a few days. (Reference No. 10, p. 18.)

The milkweed, cut when less than 6 inches high before its leaves have fairly unfolded from the stalk, is considered almost equal to asparagus, and may be used to extend a scanty supply of the latter.

The sour sorrels, so abundant on poor soil, may be added to soups or salads, and the larger leaves of the cultivated imported varieties make excellent greens.

The chicory, which is a common weed in many places, furnishes excellent greens, much like the dandelion, only rather more bitter. They are better if blanched by covering the plant with an empty flower pot or in some similar way. A plant nearly related to chicory, carefully grown and blanched, is the "endive" of the market gardeners.

The cowslip or marsh marigold is sufficiently abundant in some regions to serve as a food plant, and is prepared like spinach or other greens.

Poke sprouts are a favorite potherb in some regions of the Southern States and are on sale in the spring in Washington, D. C., and other southern cities. The young shoots are cooked and served like asparagus.

Purslane is one of the most common weeds now, yet in remote ages it appears to have been cultivated as a potherb and to have been brought from the East to Europe as a salad plant. It is best when well developed, but just before it blossoms, and should be cut at the surface of the ground without the roots. But little time is required for cooking its succulent, red, branching stems, which provide after cooking a dish closely resembling beet greens in flavor.

Pigweed or goosefoot or lamb's-quarters, shepherd's-purse, and similar weeds are used in this fashion. Experiments with wild plants should not be tried unless one is sure that the plant is not poisonous.

CULTIVATED POTHERBS OR GREENS.

Of the plants cultivated especially for greens, asparagus, which Charles Lamb said "seems to inspire gentle thoughts," is a general favorite. This is a member of the lily family akin to the lily of the valley. Many an asparagus bed does good service unto the second and third generation of owners (one in England is known to be over 90 years old), and it is strange that any farm should lack this long-lived, easily cultivated delicacy. (Reference Nos. 18, pp. 17, 18; 75, p. 140.)

Spinach is a favorite form of greens and is seen in city markets most of the year. A French proverb calls it the "broom of the stomach," and it appears to be richer in iron than most common foods. (Reference No. 33.) The tenderest leaves may be served raw as a salad.

Beets are rarely raised especially for greens, but surplus plants are reserved for this purpose. These are often eaten when very small. The tops of the early bunch beets brought to the city markets may often be used as greens, even when the stalk and leaf are 6 or 8 inches long. Swiss chard is a variety of the beet plant with thick leaf stems and is raised especially for greens.

Carrot tops are sometimes used as a potherb, but are too fibrous unless very young. It should be remembered that some of the same family (the Umbelliferae) are poisonous. Turnip tops are also used in this fashion, and resemble kale. Alfalfa tops are said to make satisfactory greens. Pumpkin tops also are sometimes used in this way.

Hop sprouts are seen in the Belgian markets in March and April and are even canned and exported. Care is taken to cut the sprouts so as not to interfere with the later growth of the vines.

The Japanese use young shoots of burdock cooked. They are better if blanched with earth for a few days before cutting. Then they should be parboiled, drained, and cooked again until tender, and served warm or cold with a salad dressing. Udo is another Japanese salad plant which is being tried in this country. (Reference No. 44.)

Fennel is used as a culinary vegetable in Europe and occasionally in this country. The leafstalk is thick and swollen toward the root, and thus becomes united almost like a bulb. It is used as a salad or for greens; the finely divided leaves may be cooked like spinach, while the stalks may be cut in sections, cooked, and served with white sauce like celery.

American housewives realize less commonly than those of Europe that lettuce makes excellent "greens." This, as mentioned above, suggests a good way to use the tougher or outer leaves of the lettuce bought for salad and the surplus crop of the home garden. As is the case with all potherbs, lettuce should not be overcooked. (Reference No. 87, p. 29.)

The cabbage tribe, belonging to the Cruciferæ, supplies many types of vegetables used as potherbs, and is said to contain no harmful members. (Reference No. 86, p. 180.) The original wild type was the *Brassica oleracea*. The group of plants now include the white, red, or purple, and Savoy cabbages, coleworts, borecole or Scotch kale, cauliflower, broccoli, and others. Their growth is luxuriant and a variety of forms has been developed.

The swollen stem of the kohl-rabi is one type of development, and another is the stalk surrounded by buds known as Brussels sprouts. The cauliflower (Reference Nos. 18, pp. 15-16; 69, p. 301) usually considered the most digestible of the tribe, owes its delicacy to undeveloped flower buds; broccoli is similar in form but hardly equal in quality.

Collards or coleworts are also similar to cabbage, having long, loose leaves. (Reference No. 75, p. 116.) They grow where the weather is not cold enough for cabbages to head.

Kale consists of curly, open leaves not forming a compact head. The blanched shoots of sea kale are prepared like asparagus and the

flower heads also are used. (Reference No. 18, pp. 16-17.) The sprouts from cabbage stalks left in the ground over winter may be used in the same way.

The Chinese cabbage, pak-tsai, is being tried in this country and gives promise of becoming adapted to our conditions and being a useful potherb.

Some of the cabbage tribe may be used raw when young and tender as salads, and have long been regarded as valuable preventives against scurvy.

Often when this type of plants is cooked an unpleasant odor and flavor is developed. This is obviated in large measure by cooking uncovered and in an abundance of water. (Reference No. 18, p. 13.) It is also important that such vegetables shall not be cooked too long. Once it was considered necessary to cook cabbage several hours, but a young cabbage may be made perfectly tender in 20 minutes and an older one will not take twice as long. The old idea that cabbage was indigestible was due to its being overcooked.

When cabbage or cauliflower begin to grow darker in color in cooking, changes caused by lack of ventilation and too long cooking are taking place. Such plants are therefore less satisfactory if prepared in the steam cooker than when cooked in an abundance of water.

Rhubarb is another plant in which the leafstalks are the useful portion, though it may from its use be classed as a fruit rather than as a vegetable. The various acids and other flavors it contains are acceptable in the early spring when it is at its best. Later in the season, when the stalks are tough and fibrous, the juice may be extracted for jelly making. Because it contains some oxalic acid the use of rhubarb is frequently forbidden to persons of gouty tendencies.

SEAWEEDS.

Several varieties of seaweeds are used as foods in different parts of the world, sometimes for flavor or supposed medicinal value and sometimes in place of gelatin.

Dulce is sometimes eaten raw as a salad and because of the iodin it contains has enjoyed much reputation as a medicinal plant. (Reference No. 86, p. 187.)

Irish moss or carrageen is a variety of dulce. Its greenish purple tint fades out as it dries on the beach. Though of slight food value, since more than half its substance is a kind of mucilage which the body does not assimilate, it has long been used like gelatin; its use for the stiffening of blanc mange, etc., was formerly more general than at present. (Reference No. 73, p. 164.) Iceland moss is a kind of lichen used to stiffen desserts, etc., and is supposed to have a soothing effect in cases of irritated throats.

Agar, or Ceylon moss, a seaweed from the Indian Ocean, is much used as a culture medium in biological laboratories, and is also used by many cooks in place of gelatin of animal origin. (Reference No. 75, p. 222.)

EXPERIMENT AND PRACTICE WORK, THIRD LECTURE.

Materials needed.—Different greens according to season, such as spinach, cabbage, cauliflower, Brussels sprouts, canned asparagus; also butter, eggs, and salad dressing. A quart of Brussels sprouts and a peck of each of the green vegetables are convenient amounts.

Utensils.—Saucepans for boiling vegetables, pans for washing, knives, colander, chopping bowl, and chopping knife.

The first step in the preparation of all these plants is thorough cleansing, for though the boiling process might render invisible dirt harmless (Reference No. 28, p. 13), sand is particularly obnoxious in greens.

The best plan is to sort and trim off all old or imperfect portions, then wash leaf by leaf and float in several waters in order that all solid particles may settle to the bottom of the pan.

Preparation and Cooking of Potherbs and Similar Vegetables.

Exercise 1.—Let each pupil weigh, trim, and wash several roots of spinach; weigh refuse, estimate the percentage of loss. Cook in little salted water approximately 30 minutes, or till tender. Let this be done individually, and the amount of sand be noted. Drain, measure the leaves, and compare with original bulk. (Reference Nos. 18, p. 17-18; 70, pp. 299-300; 75, p. 140.)

Let each pupil prepare some one of the following and all results be compared:

- (1) Cook spinach in its own juice, in covered saucepan.
- (2) Cook in considerable water uncovered.

Serve 1 and 2 plain and compare their flavor.

(3) After cooking, drain, chop, rub through sieve, reheat, add a little cream or white sauce.

(4) Mold in cups, garnish with egg rubbed through strainer.

(5) Cream of spinach soup; prepare spinach as in exercise 3; then dilute to desired consistency with milk.

Exercise 2.—While the spinach is cooking each member of the class may be given a different kind of plant, if as many are obtainable.

The preliminary preparation should be similar to that of raw salad plants or spinach; remove all dirt, decayed portions, etc.

Sort out tougher portions and give them longer application of heat; when they are partially cooked, add the tender parts.

So far as possible cook most vegetables uncovered in sufficient boiling water to prevent all danger of burning. The water should bubble.

Exercise 3.—If possible provide one pupil with a few Brussels sprouts, one with cabbage, one with cauliflower, etc.; in this way small quantities will serve for the class and all varieties may be cooked at the same time.

Such plants should be soaked head down in cold salted water before cooking. (Reference No. 18, p. 9.)

Use center of cabbage for salad, outside for boiling. Serve boiled cabbage in the following ways:

- (1) Plain with butter.
- (2) With oil and vinegar.
- (3) With white sauce.
- (4) With white sauce and crumbs. (Reference No. 73, p. 150.)

- (5) With white sauce, crumbs, and cheese.
- (6) With sausage. (Reference No. 18, p. 14.)
- (7) With potatoes (kolcannon). (Reference No. 18, p. 15.)
- (8) German cabbage. (Reference No. 73, p. 150.)

Exercise 4.—Supply each member of the class with a different "green" if possible.

The preliminary preparation should be similar to that for the raw salad plants. Even if all is to be cooked it is desirable to sort out the tougher parts and give them a blanching (Reference No. 18, pp. 10-11), or parboiling before combining with the tenderer portions.

Let each vegetable cook uncovered in sufficient boiling, salted water to prevent any danger of burning (with the exception of spinach in its own juices, which must be covered).

Adopt a small standard portion suitable for one serving per person—2 ounces or one-fourth cup is a fair average—estimate cost, including original cost, labor, and cost of additions. Compare with cost of canned vegetables.

Observe the constant tendency to add to such plants the protein, fat, etc., which they lack by combining with them milk, butter, eggs, and salad dressings.

When few fresh greens are available, use canned asparagus. Remove from can, taste of liquid, and reserve it if the flavor is good. The stalks may be reheated and served on toast. Or tips may be served for salad with French dressing, and the stalks used for cream of asparagus soup. (Reference No. 73, p. 77.) Split open stalks, add liquid from can if suitable, heat, rub all possible through coarse strainer, add milk, thicken and flavor.

In each case work out the cost of material in city and in country, and add the labor of preparation. Note the advantage in the country in the use of such by-products or weeds as thinned-out best greens or purslane.

Irish moss blanc mange may fitly form a part of this lesson. (Reference No. 73, p. 164.) The whole moss is preferable to the sea-moss farina.

Stewed pieplant or rhubarb will also illustrate use of leafstalks as food. (Reference No. 73, p. 15.)

This lesson may be carried out in the preparation of a luncheon or simple dinner with either of these menus:

No. 1.

- Cream of asparagus soup.
- Spinach and eggs.
- Creamed cabbage with cheese.
- Stewed rhubarb.

No. 2.

- Cream of celery soup.
- Asparagus on toast.
- Kolcannon (potato and cabbage).
- Blanc mange.

REVIEW QUESTIONS, THIRD LECTURE.

1. Explain the terms "greens," "potherbs."
2. How divide plants that part may be used for salads, part as greens, or in other ways?
3. Give general directions for choosing, cleaning, and cooking dandelion greens.
4. Give a list of wild plants in your vicinity suitable for this purpose. How many have you tried?
5. Explain the shrinkage common with such foods.
6. Why is fat meat often cooked with plants of this type?
7. Give general directions for cooking cabbage or cauliflower.
8. How many asparagus beds in your neighborhood? Give method of preparing canned asparagus.
9. What reasons for use of white sauce with cooked cabbage, celery, etc.?
10. Give directions for making white sauce.

COURSE IN VEGETABLE FOODS.

FOURTH LECTURE—BULBS.

THE ONION TRIBE.

Next to leaves and stalks we may study bulbs, which may in a way be considered as a form between stems and roots.

Bulbs are a kind of bud, spheroidal in shape, and from the botanist's standpoint consist of a cluster of leaves, modified in form and tightly folded together, one over the other. Usually they form above or just below the top of the ground. In some cases the young bulblets appear in the axils of the leaves (tiger lily) or at the blossom, as in top onions.

Such bulbs are characteristic of the lily family, which includes some of the most ornamental plants of the flower garden—hyacinths, lilies, narcissus, and tulips, for example.

The American Indians used certain wild lilies as food, and the bulbs of some garden lilies are eaten in Japan and China and are also sold in Chinese shops in American cities. In American homes the lily bulb had some use in olden times for medicinal purposes.

From the culinary viewpoint, however, the Allium tribe of the lily family includes the most important of the bulbous plants, namely, the onion and some of its relatives.

The derivation of the word "onion" is significant, indicating the oneness of the bulb or close union of the underground stems. The onion appears to have been a native of Asia and to have been used by the human race from the most ancient times. It is mentioned in the Bible and in old Egyptian writings. (Reference Nos. 87, pp. 106-107; 100, pp. 223-226.)

No one seems ready to say what is the special virtue derived from plants of the onion race, but most dietitians agree that it is wise to serve them frequently either raw or cooked.

Onions owe their flavor to a volatile, oil-like compound containing sulphur, which has been carefully studied by chemists. They are very succulent, but nevertheless supply some nutritive material, chiefly carbohydrates, as is the case with most succulent vegetables.

There is a large variety of onions (*Allium cepa*) available, and all of them are useful in turn. Many varieties are grown by American farmers and gardeners, and the crop is a very important one and supplies the bulk of the onions found in our markets.

The tiny pearl and button onions are convenient for salads or pickles or for the hint of flavor wanted where a large onion would be far too much.

From the Bermudas and the South in the early spring come flat, crisp onions of a purplish tint which are appetizing either raw or cooked, and more agreeable in texture than the coarser varieties commonly raised for the winter market. The large Spanish onions are mild and tender, suitable for salad or cooking purposes. The white-skinned Egyptian onions are usually a satisfactory variety. There are many onions in the market which are strong in flavor and tough, and justify the prejudice which the undiscriminating have against all onions. In general, the greenish yellow and red types of onion, owing to their texture and flavor, are less satisfactory for cooking as a vegetable than those of lighter hue.

Garlic is of interest in the study of bulbs, even to those who may not like its flavor. Each bulbous root or stalk is a compound made up of several smaller bulblets, each of which is known as a clove of garlic, clove signifying the cleavage or splitting of the larger group. This plant, like other members of the onion race, has been used in cookery from the earliest times, and its use is especially common among the Latin races in southern Europe. Rightly used and in small quantities garlic is considered a desirable seasoning by most trained cooks. A salad may be flavored by rubbing the dish with the cut surface of a clove of garlic. The oil of garlic, which gives it its flavor (Reference No. 86, p. 183), is composed mainly of allyl sulphid, a substance common to all the onion family—*asafetida*, radishes, cress, mustard, etc.

The leek is another useful plant of the same race. The bulbous portion is much elongated, cylindrical rather than spherical, and the leaves are long and flat and sheathed over each other. In cultivation the lower part of the leafy part of the leek is blanched, like celery, for several inches. This plant also was known to the Egyptians, Greeks, and Romans, and is the national emblem of the Welsh.

To cook leeks remove the fine roots and green ends of the leaves and cut the white portion in 3-inch lengths. Wash and cook in boiling water until tender; that is, for 20 minutes or more. Serve on buttered toast like asparagus or with white sauce. The stocks, if too thick, may be split and flattened after cooking. The water in which leeks are cooked may be used in soups. Closely related species called wild leek or wild garlic grow in some parts of this country and are liable to flavor the milk and butter of cows that eat them in the pasture. Wild leek is sometimes used as a seasoning. The shallot is a cultivated plant similar to the leek, but with a tubular leaf.

Ordinary young onions are often sold under the name of "scullion" or "scallion," which properly belongs to any thick-necked or un-

developed bulb of the onion tribe which has not grown round, but more nearly resembles the leek in shape. In onion beds these are pulled out and marketed when young, or they may be grown from the bulbs of the previous year. The name is derived from Ascalon in Syria and belongs especially to the shallot, which is also known as cibol or eschalot by the French and which is a dwarf onion resembling the leek in that it has no distinct bulb and has tubelike leaves.

Chive is a perennial of this same race, the leaves of which have a delicate, appetizing flavor frequently relished by those who object to the stronger onion flavors. Chives are sometimes used as a border plant in flower gardens, having an attractive blue blossom. A clump of these tiny bulbs will grow for weeks in the house; if they are planted in a dish of mixed ferns the peculiar shade of green in their leaves will make an attractive combination with the other plants, and the fine stalks may be cut as needed to flavor salads and soups. The essential oil is so abundant that a very small quantity of the leaf suffices. Onion tops, like the stalks of wild leeks and chives, can also be used for flavoring, especially the sprouts that start when the bulbs have been kept in a warm room. The young spring onions are sometimes eaten like radishes as a relish, or cooked and served like asparagus, and are a favorite dish.

Rocambole somewhat resembles leek, and is also called sand leek.

EXPERIMENT AND PRACTICE WORK, FOURTH LECTURE.

Materials needed.—Butter or drippings, salt and pepper, milk, egg; one or two onions for each pupil, different varieties preferred; specimens of as many of the other members of the Allium tribe as possible.

Preparation of Onions.

To prepare onions, peel under water so that the volatile bodies which affect the eyes may remain in the water and be kept from scattering. Where the onions are especially strong or liable to prove indigestible to anyone, they may be put, after peeling, into boiling water, to each quart of which one-fourth teaspoon of bicarbonate of soda has been added. After letting them stand in this water half an hour, drain and boil in plenty of salted water from $\frac{1}{2}$ to 2 hours, according to the nature of the variety in hand, changing the water if desirable.

Often it is wise to take off one or two of the coarser layers next the outside skin and reserve them for flavoring soups, while a part of the tender succulent center may be reserved for a salad. This plan of selection corresponds to that already suggested for cabbage, celery, lettuce, etc.

Methods of Cooking.

The water in which onions are boiled will contain much flavor, and some of it may be reserved to flavor soups, either milk or stock.

Any strong variety of onion is much improved for the table in spite of loss of nutritive value if the water is changed several times during the cooking process. Milk may be used as the medium for final cooking.

If onions are cooked uncovered, the odor apparent in the house is less intense, and, like cabbage and beans, they are commonly said to be more digestible when thus cooked. (Reference No. 18, p. 13.)

There is a culinary tradition that parsley eaten with onions not only sweetens the breath, but counteracts the tendency toward flatulence.

Securing Onion Flavor.

The simplest way to extract onion flavor for seasoning salads, etc., is to cut a slice from the root end of the bulb and press the cut surface firmly against a grater, turning gently until some drops of juice fall. Cut off another slice and press the fresh surface again if more flavor is required.

When the onion is old and has begun to sprout there is little juice to flow and more pressure must be used; the soft pulp which passes through the holes of the grater will serve instead of the juice. Sometimes with a fresh onion the grater is unnecessary, as sufficient juice will follow a few gashes from a knife.

Another way to secure onion flavor is to cook the chopped bulb in water, milk, or stock. Slices from which some of the juice has been extracted will again yield flavor if cooked in that way.

A third method is to extract the juice in fat, and for this purpose sliced onion is cooked in the fat until light golden brown, or sometimes until very brown, thus securing a combination of caramel from the browned sugar and the peculiar flavoring bodies of the onion, a flavor quite different from those obtained by either of the other methods. The scraps of onion may be strained out and the flavored fat added to sauce or soup, or they may all be used together.

Onion for forcemeat or stuffing may be prepared in any one of these ways, or chopped onion may be blanched or scalded in soda water and then added directly.

A little chopped or finely cut onion may be prepared without soiling the fingers by peeling the onion on a fork, cutting off the outer skin, cutting into one end in different directions, and then slicing off on a piece of clean paper as much as is needed.

Each pupil may boil two varieties of onion or an onion and a leek and note the time required and other points of difference in each. Save the water, note color, compare flavor.

Further exercises follow:

Spanish Onion.

Cut an onion in two, reserve small portion of center for salad, parboil remainder 10 minutes, save water. Cut onion small, put in saucepan with 1 tablespoon butter or dripping, a little salt and pepper, cover and cook slowly until tender.

Another method for preparing this dish is as follows: Cut, reserve center, cook in water until tender, combine with milk or white sauce.

Still another method for Spanish onion is: Cook as before in a little water, when soft rub onion with water through strainer, add milk, thicken and season. Try with further addition of (a) egg, (b) cheese. (Reference No. 73.)

Onion and Apple Salad.

Slice centers of Spanish onion very thin. File up slices and cut across to divide still finer. Combine with twice as much sliced apple. Leave red skins

[Vegetable Foods, Bul. 245.]

on apple as garnish. Add French dressing and chopped parsley or pepper. Mayonnaise or cooked dressing may also be used.

Onion Soup Without Meat.

French families are fond of an onion soup which is very easily and quickly made and very palatable.

Peel a good-sized onion, cut in small pieces, and cook slowly and carefully until tender in a heaping tablespoonful of fat or of butter. Then move the saucepan to a hotter part of the stove and cook the onion until well browned, stirring all the time to prevent burning. Add a pint and a half of boiling water, or milk and water half-and-half. Season with salt and pepper, bring to a boil, and serve poured over a piece of toasted bread, or serve small cubes of bread fried in butter. If no milk is used, it is a common custom to serve some grated, mild-flavored cheese, such as Swiss cheese, with the soup, which may be added to it as desired.

Fried Onions.

Fried onions may be prepared in either of two ways: (1) Sauté sliced onion in olive oil, butter, or other fat until golden brown and tender; or (2) fry a few pieces at a time in deep fat, let them remain in the hot fat until they are crisp, like Saratoga potatoes, but do not let them become too brown. (Reference No. 70, p. 296.) Use to garnish meats or add to soups, or combine with potatoes, stewed beans, or other vegetables.

Stuffed Onions.

Parboil large onions, remove centers without breaking other layers, and stuff with seasoned crumbs or meat, and bake until tender.

Onion Custard.

Cook onions until tender; drain thoroughly. Pour over them a custard mixture made of one egg, one-half cup milk, salt and pepper to taste, for each half pint of onions. Bake gently and serve as a vegetable. In southern Europe this dish is popular cooked in a crust, like small custard pies.

Onion Soufflé.

Chop cooked onion fine or rub through a coarse strainer. Combine with equal quantity soft bread crumbs or half as many dry ones. Season with butter, salt, and pepper. For each half pint beat in one egg yolk and fold in one stiffly beaten white. Put in small dishes or in onion cases and bake gently until firm.

For making tests of the different food materials in onions, see Reference No. 79, pages 116-117.

REVIEW QUESTIONS, FOURTH LECTURE.

1. Describe a bulb. Give examples.
2. Tell something of the history of the onion.
3. Mention and tell characteristics of other members of the same family of plants.

[Vegetable Foods, Bul. 245.]

4. Give general directions for preparation for the table.
5. When the flavor is objectionable, how may it be reduced?
6. What portion of an onion would be most acceptable in a salad?
7. Describe several ways of extracting flavor from the onion for soups, salads, etc.
8. Suggest some method of warming over boiled onions left from one day's dinner, so that they may appear in different form.
9. Is the onion a desirable food?
10. Tell how to make an onion soup.

[Vegetable Foods, Bul. 245.]

COURSE IN VEGETABLE FOODS.

FIFTH LECTURE—TUBERS AND ROOTS.

During the favorable season some plants store material for future growth in enlarged roots or underground stems. From the botanical viewpoint it is important to distinguish between true roots, such as turnips and beets, and underground stems, such as onion bulbs or tubers, of which the common potato is a familiar type, but for the present purpose divisions which show their nutritive value are quite as important. Nearly all these roots and underground stems contain large quantities of water. Sometimes the plant has stored most of its food as insoluble starch, which appears in grains throughout the enlarged portion of the root or stem, as in potatoes and many tropical plants, such as cassava. Such tubers and roots may be roughly grouped as starch-bearing ones. On the other hand, some plants, such as the beet, store much of their food in the form of soluble carbohydrates (sugar in the case of the beet), which are dissolved in the water and give the root a more or less juicy character; these are classed as succulent roots. Such distinctions, though rather imperfect, will aid in understanding the nature and food value of the tubers and roots to be described in the following lecture. (Reference No. 79, pp. 41-46, 114-115.) Two distinct vegetables are commonly used in the United States under the name potato, i. e., the white or Irish potato and the sweet potato or yam of the Southern States.

WHITE OR IRISH POTATOES.

The prominence of the white or Irish potato in the daily diet of most Americans justifies special attention to it in these lessons. It has been called the king of vegetables. Though a native of America, it became so generally adopted in Ireland that it is now frequently termed the Irish potato.

Many incidents are told of the slow recognition it received as a valuable food, and its early history is connected with Sir Walter Raleigh, Sir Francis Drake, and other early visitors to the New World.

According to the historian of an early New England town:

Even potatoes could not be afforded for ordinary use for many years. During the Revolution a well-to-do family thought itself well off if it could have a barrel of potatoes for winter use. And these were kept for rare and special luxuries and a choice honor to a guest; but potatoes flourished so well in the new soil that early in 1790 they became a staple article of food.

One reason why the potato has become such a favorite vegetable is doubtless its lack of pronounced flavor. It harmonizes with foods having a more positive taste, and one does not tire of it as one would of the continuous use of turnip or squash. Then, too, it is easily grown, gives an abundant yield, and may be readily stored for winter use. Mankind almost universally uses starchy food, and this nutrient potatoes abundantly supply in palatable form.

Potatoes should weigh 60 pounds to the bushel, or 15 pounds to the peck. As three or four average potatoes will together weigh 1 pound, a peck should number from 40 to 60.

The oftener potatoes are handled in their transit from producer to consumer, the poorer their quality and the greater the percentage of refuse. When received from the market it is desirable to sort them carefully, that those of the same size may be cooked together—smooth, medium ones to be baked, large ones to be steamed in their skins, and imperfect and inferior ones to be pared before boiling. Any portions that are dark-colored or green should be removed, as they may impart a bad flavor to the rest. Sprouts should be broken from potatoes before cooking. (Reference No. 22, p. 19.)

When potatoes are old and wrinkled they are much improved by cutting off the ends or by partially or wholly paring and by soaking in cold water for several hours like dried beans, etc. In fact, inferior potatoes of any age are much improved by paring and soaking. Where potatoes are inexpensive or the parings can be fed to animals it is often a profitable custom to pare before cooking, since thus imperfections and strong-flavored portions are disposed of, leaving a nearly pure starch, comparable to arrowroot or tapioca and ready for the table as soon as cooked; this is true notwithstanding that careful investigations have proved that such cooking causes considerable loss of the nutrients in the potato. (Reference No. 32, pp. 25-31.)

When potatoes are the only vegetable attainable it might be wiser to cook them without paring, so that their mineral salts may be retained, but people who use salad plants and other vegetables freely are justified in considering chiefly convenience and palatability in the preparation of these tubers.

Often it is a convenience for the housekeeper who has several dishes to prepare at once just before dinner to have the potatoes pared earlier in the day.

Most good cooks believe that it is wiser to discard the water in which potatoes are boiled, as it is likely to be strong in flavor. (Reference Nos. 22, p. 19; 60, p. 229.) For general directions for cooking potatoes see Reference No. 18, pp. 27-29.

Potato flour may be found in large groceries and is used in cakes and for thickening purposes.

SWEET POTATOES.

Sweet potatoes (Reference Nos. 18, pp. 29-30; 25, p. 39) are not strictly tubers, but tuberous roots. There are many varieties of the plant, with different shape and color. Northern markets prefer a dry, smooth, yellow type, while in the South the moist varieties showing more sugar when baked are the favorites. They may be kept in a dry place at a temperature of 50° to 65° F., and are sometimes canned and often dried like fruits for family use. A flour is also made from the sweet potato.

Because their sweetness is to some extent lost in water they are better steamed than boiled, and baking is a favorite method.

After steaming they may be sifted and used in puddings or pies like squash or added to breads.

In southern homes the sliced sweet potato (often first parboiled) has always been cooked with sugar, butter, and other seasoning. Such dishes, under a variety of names, are now general favorites.

When the tubers are baked the process should not be too rapid, but should continue for an hour or until the skin separates from the pulp, and in the case of the varieties moist when cooked, until the sirup condenses, and the pulp grows moist. The negroes in the Southern States bake them in the ashes in the fireplace, and as soon as one meal is over put in those needed for the next. (Reference No. 18, pp. 29-30.)

JERUSALEM ARTICHOKE, YAM, CASSAVA, AND OTHER STARCH-BEARING TUBERS AND ROOTS.

(Reference Nos. 18, p. 30; 22, p. 28.)

The Jerusalem artichoke is a kind of sunflower which has a thickened rootstalk valuable for food. The carbohydrate material in the tuber is like gum rather than starch, which gives a peculiar texture after cooking. The tubers were more popular before potatoes came into general use. They are crisp in the spring before they begin to grow, and may be cooked like potatoes, or served raw as a salad like radishes, or pickled. They are common in many rural regions, are found in city markets, and are not expensive.

Yam (Reference No. 22, p. 32) is a name carelessly applied to some types of sweet potato. The true yams belong to the genus *Dioscorea* (Reference No. 48), and include many species abundant in the Tropics, but which may also be grown in temperate regions. Many are grown in the West Indies and Florida. They are rich in starch, though lacking the sugar of sweet potatoes, and the flavor is pleasant when they are boiled or cooked in other ways.

Many of these tubers are most satisfactory when baked, but, like the potato, they may be prepared in other ways.

A new tuber which has received some attention from the Bureau of Plant Industry is the dasheen from tropical countries. (Reference No. 22, p. 31.) The plants resemble the caladium, which is such a popular ornamental plant, and the taro, which provides the "poi" of the Hawaiians, and which is a staple food in many tropical islands. The dasheens may be served like potatoes, boiled, fried, creamed, etc., but to many are, like potatoes, most acceptable when baked. They have a rough outer coating, which may be partially removed before cooking. If entirely pared there is a tendency to discolor, as with potatoes.

The yautia (Reference No. 22, p. 31) is a Porto Rican tuber very much like the dasheen, which may be used like potatoes. *Stachys* (Reference No. 22, p. 29) is a tuber introduced from Japan and has little practical value, as it is not marketed in any considerable quantity.

Cassava belongs to the spurge family (Reference Nos. 8; 22, p. 30), and forms roots rich in starch. There are two principal types of the plant, the bitter and the sweet manihot. The first is commonly grown in the Tropics and requires a longer season than the other, but produces a greater yield. The many varieties of the bitter cassava grown in Brazil contain in relatively large amounts the volatile poison found in this family of plants. This is dissipated by heat and the washing of the grated roots. The sweet manihot is cultivated in some of our Southern States, but mainly for starch to be used in textile and other industries. From both varieties tapioca of various forms is made, as is also the cassava bread which is so common in tropical countries, and which is found in many city shops under the name of cassava cakes.

Arrowroot (Reference No. 103) is the name of the fine starch obtained from various tropical roots, and is due to the fact that the pounded roots were applied to swellings from poisoned arrows. The best arrowroot comes from Bermuda and the West Indies. In Europe it is popularly supposed to be the most digestible form of starch, and is much used for infants and invalids, as well as in fine puddings and similar dishes. (Reference No. 60, p. 236.) In the United States cornstarch, the "corn flour" of English cooks, is more generally used.

Sago may be properly studied in connection with tapioca, arrowroot, and similar starches, as its use is very similar, but it is the product not of a root or tuber, but the pith of a palm tree. The trees are cut and split; then the starch is washed, dried, and granulated. Fifteen years are required to grow a palm yielding 500 pounds of sago. The tree must be cut before blossoming. If time permitted, it would be interesting to study other palms which yield food products, especially the "cabbage palm" and those producing coconuts.

The principal food substance derived from all the underground stems enumerated is the starch which has been thus stored up for the next generation of the plant's life. Starches from different plants or plant parts differ in the form of the starch grain, so that starches of various kinds can be identified by the aid of the microscope. But from the culinary standpoint they are practically interchangeable, and one form of starch may be substituted for another in nearly all cases. Just as we may substitute the yam or a dish of rice for the potato as a vegetable, so we may use starch from the potato, or corn, or wheat, or rice for thickening gravies or making puddings, making slight changes in proportion, according to the expansive powers of each kind.

Starch cookery is a very important subject. That starch may be cooked it is essential that every starch grain be brought into contact with water of at least 140° to 178° F. (Reference No. 35, p. 25.)

Potato, arrowroot, and probably tapioca and sago starch pastes are not made more easily digestible by long-continued cooking. * * * However, in the case of starch still inclosed in cellulose cells, as in many starchy foods, the long-continued cooking may be necessary. (Reference No. 35, p. 41.)

The selection of potato starch instead of corn or wheat starch for thickening sauces in accordance with the custom of French cooks is rational, * * * since it does not require 40 minutes boiling for improvement in flavor as is the case with cornstarch. (Reference No. 35, p. 42.)

For further study of starch see Reference Nos. 14; 34, pp. 24-48; 85, pp. 109, 119, 146.

EXPERIMENT AND PRACTICE WORK, FIFTH LECTURE.

Materials needed.—A potato for each pupil; any other tubers available; rice, tapioca, cornstarch, rice flour, fruit juice or jelly, milk, butter, salad dressing; fancy cutters, slicers, and scoops, different styles of potato mashers and ricers. These for trial; a fork may be used to mash a small quantity.

Exercises.—Let each pupil prepare a potato; each in slightly different fashion according to the directions given below; weigh before and after cooking, weigh refuse, estimate percentage of loss and time and fuel required for cooking one potato. Are these factors proportionately increased for a larger quantity? Compare time required to pare potatoes before cooking and after. What advantages for either method?

Potatoes.

While the potatoes are cooking grate one raw potato, press out the water through a cloth or wire strainer into a glass measuring cup. Estimate percentage of water in the potato (reference No. 34, p. 14), then wash out the starch and cook it. (Reference No. 74, pp. 83-84.) Observe the nature of the material remaining in the strainer.

Among the methods of cooking potatoes which may be tried in this lesson are these:

Baked (1). Serve one at the right moment, leave another until the moisture condenses and the potato becomes soggy, with unpleasant odor and flavor.

Baked (2). Cut, skin in half lengthwise, mash and season contents and return to skin. Add beaten egg white to one half, bake and notice difference. How is this difference caused?

Baked (3). Bake in dish, skin having been removed first; glaze occasionally with butter or meat fat.

Boiled. Cook one in skin, another without skin.

Steamed. Cook one in skin, another without skin.

Mashed. Boil one potato, mash, season with butter, salt, etc., add hot milk, measured, and note how much the potato will absorb.

Cut and boiled. Cut a potato in slices or cubes, add milk and seasoning as in previous recipe, and compare results. Add grated cheese to part.

Soup. Make soup from mashed potato in same fashion as with onion in previous lesson. Note lack of flavor—some addition of onion or celery indicated. Also note slight thickening needed in potato soup compared with onion soup.

Salad. Make salad with cooked potato and onion like apple and onion salad in Lesson 4.

Look up composition of potato. (Reference No. 30.) How does this explain the need for the addition of other materials?

For various dishes in which potatoes are an important ingredient see Reference Nos. 69, pp. 292-296; 72, pp. 59-67; 77, pp. 458-470.

Comparison of rice and potato. Weigh out $\frac{1}{2}$ pound rice and cook in 2 quarts of rapidly boiling salted water until tender, and drain. The water may be reserved for soup in next lesson. (Reference No. 18, p. 38.) Cook an equal money value of potatoes. Compare value of results, including cost of fuel and labor expended and considering refuse in potatoes, etc.

Experiments with Starchy Materials.

Let each pupil or each two take a different form of starchy substance, flake, pearl, granulated tapioca, cornstarch, rice flour, sago, starch from potato, etc.; cook with water until fairly transparent, salt slightly, and taste of each to learn to recognize characteristic flavor. Flavor with fruit-juice and sugar in similar proportions and taste again to see how uniformity in the dominant flavor disguises characteristics of the starches. Note possibility of substitutions in recipes. (Reference No. 34, pp. 24-28.)

REVIEW QUESTIONS, FIFTH LECTURE.

1. Show differences between bulbs and roots; roots and tubers.
2. What are the principal food substances derived from roots?
3. Where did the potato originate and when was it introduced into Europe?
4. What differences in the nature of the new and old potato? How do these influence methods of cooking each?
5. What is the weight of an average potato?
6. Give approximate chemical composition of the potato.
7. How may we find that the potato contains starch?
8. From potatoes as ordinarily purchased how select for baking, steaming, croquettes, etc.?
9. Describe general preparation and use of the sweet potato.
10. What other roots and tubers furnish valuable starch?

[Vegetable Foods, Bul. 245.]

COURSE IN VEGETABLE FOODS.

SIXTH LECTURE—SUCCULENT ROOTS.

The majority of these root vegetables are those where the main or taproot has become thick and fleshy. Cross sections of different specimens of such roots carefully examined, even without a microscope, will aid in understanding the effect of heat and moisture upon such foods. In older vegetables of this type woody fibers or cellulose will be found, which does not yield readily to the processes of cookery.

This class of plants has long been cultivated by mankind, and was used more generally before the introduction of the potato. Occasionally they are combined with potatoes.

BEETS.

The beet gives an excellent illustration of the difference between the young and old plant. The whole plant in an immature state may be cooked for greens (see Lecture 3), but by the time the beet is as large as an egg, the leafstalk is too fibrous to use. The bunches of beets from warmer climates found in northern markets in the spring usually have leaves that may be cooked and served for greens with the sliced roots, and these yield to the influence of heat and moisture in half an hour. Large winter beets which have been out of the ground for months have lost moisture and become woody, and may require four hours or more to make them eatable. Pickling in vinegar must often be resorted to before such beets are really tender. (Reference No. 73, p. 149.)

Beets contain a larger percentage of sugar than most vegetables, and should be baked or steamed to retain as much of this as possible. At all events, they should be cooked in the skins, and the tip of the root and a portion of the leaf stems should also be left on until after cooking. Even so, some color and sweetness are lost in the water in which they are cooked.

TURNIPS.

The turnip is cultivated in many varieties, but those used for human food fall into two main classes, those with white-fleshed roots and those yellowish in color, the latter are called rutabagas or "Swedish" turnips. (Reference No. 22, p. 39.)

KOHL-RABI.

The kohl-rabi, which belongs to the same family as the turnip and the cabbage and combines characteristics of both, has been described on page 29.

RADISHES.

Radishes, red or white, when a little too large to eat raw, may be cooked like turnips and served with a white sauce.

CARROTS.

The tribe of Umbelliferae furnishes many of the root vegetables. A characteristic is the much-divided leaf, so noticeable in the carrot, celery, parsley, and parsnip. Some of the herbs used chiefly for flavoring purposes also belong to this group. (See p. 68).

The carrot may have been a native of England, or, if not, was introduced at an early period. It is believed that originally the root was hard and fibrous, and that the fleshy outside has been developed by cultivation. As with other vegetables, there are many varieties, and some are so coarse in texture that those who have known no other type consider the carrot unfit for human food. Small or young carrots properly prepared are deservedly popular. Raw carrots often are eaten by children, and are advocated by those who believe in the use of raw foods. When grated, raw carrots may be used in soups without further cooking, or added to salads. The carrot contains so much sugar that its use for sugar making, in the same way as the beet, has been seriously considered.

PARSNIPS.

The parsnip is said to have been cultivated even before the Christian era. The woody fiber of these roots is softened by freezing without injury to other portions. Hence they are left in the ground until the frost comes or even through the winter. But the roots must be used before they begin to grow again or they lose their sweetness and get "rusty." The larger ones are likely to be less sweet and more woody. Small parsnips just from the ground in the spring will cook in less than a half hour. If steamed in their skins, they lose less sweetness than by boiling. They should be peeled after cooking, and served plain or with white sauce, or sautéed in butter or mashed and made into fritters. They may be made into a stew with potatoes, onions, and milk. (Reference Nos. 18, p. 31; 73, p. 156.)

CELERIAC.

This is a variety of celery (see p. 24). (Reference Nos. 18, pp. 32-33; 22, p. 35) sometimes known as German or "knob" celery or "turnip-rooted" celery, and resembles the turnip in shape and tex-

ture, and may be cooked in like manner. Often if it is desired to retain all the flavor in the root, it is more satisfactory to steam than to boil it. Again, it may be pared before cooking, in which case the water should be saved to flavor soups, etc. Where time must be saved celeriac, like carrots, may be cut in cubes before cooking, then there will be still more loss of flavor, but the result may be more agreeable to some palates, and if the water is reserved for another purpose nothing is lost.

SALSIFY.

This vegetable, which on account of its flavor is sometimes called oyster plant, is available during the late fall and winter, and, like the parsnip, may be left in the ground during the winter. (Reference No. 22, p. 38.) The resemblance in flavor to the oyster is most apparent when the boiled vegetable is sautéed in butter or made into fritters. (Reference No. 18, p. 31.) The root turns dark quickly if the skin is removed before cooking, and after paring should be dropped at once into vinegar and water to prevent discoloration. After boiling for about 30 minutes, the salsify may be served with butter or white sauce, or mashed and made into fritters. (Reference No. 20.) It is also used made into a soup with milk.

CONDIMENTAL ROOTS.

Ginger and horseradish are other valuable roots, but are used not so much for food as for the flavor or relish they give to other things. (See Lectures 10 and 14.) (Reference No. 47.)

EXPERIMENT AND PRACTICE WORK, SIXTH LECTURE.

Materials needed.—Old and new root vegetables of any kind within reach, such as beets, carrots, parsnips, celeriac, or salsify; graters, cheesecloth, test tubes, saucepans, measuring cup, tablespoon, teaspoon, and knife; cup milk, butter, flour, salt, pepper.

Exercises.—Grate portions of each root available and note the proportion of water and the nature of the woody fiber. Compare results with those from the potato in the previous lesson. How about the proportion of starch? Taste the extracted water. Evaporate it and taste again.

Parsnip, Salsify, Beet, and Celeriac.

- (1) Cook some parsnips, separating outer layer beforehand, and notice which part cooks sooner.
- (2) Pare some before cooking, and cook others in the skin in separate kettles. Taste the water from each. Which has lost most sugar, presumably?
- (3) Steam some parsnips of same size as those that were boiled. Compare time required for each process. Prepare salsify in same way. Use each for fritters or to sauté.
- (4) Cook beets whole, in skins, and in smaller sections and note loss of juice and color.
- (5) Try celeriac in the same ways.

[Vegetable Foods, Bul. 245.]

Carrots.

(Reference Nos. 22, p. 36; 32, pp. 16, 17.)

- (1) Cook one large old carrot whole in the skin.
- (2) Cook one large old carrot whole with skin scraped off.
- (3) Cook one large old carrot in slices.
- (4) Cook one large old carrot cut in cubes.

If necessary these may all be boiled in one kettle and thus variation in time of cooking shown; but the difference in loss of substance can be shown only by cooking each size by itself. Compare, if possible, with young carrots as to time of cooking, texture, and sweetness.

The carrots cooked as above may be served: (1) Plain with butter, (2) with cream or white sauce, (3) buttered and combined with half as many green peas, or (4) buttered and blended with a little chopped parsley or chives.

For further experiments grated carrot may be made into marmalade with sugar and lemon juice or added to a suet pudding. (Reference No. 69, p. 332.) Grated carrot or that which has been put through the meat chopper makes an effective garnish for salad and may be used without cooking. It may be added to soups with little more cooking than is needed to heat it through.

White Sauce for Vegetables.

If the white sauce has been studied in a previous lesson with cabbage, onions, or potatoes, here is a chance to review it or otherwise to take it up. (Reference No. 73, pp. 63-65.)

Follow directions given in reference, using 1 tablespoon butter, 1 tablespoon flour, and one-half cup milk. Make another sauce in the same fashion, but in place of half the milk use the water in which carrot, celeriac, etc., were boiled.

REVIEW QUESTIONS, SIXTH LECTURE.

1. Describe the structure of roots.
2. Tell of the methods of growth and preparation for the table of five common root vegetables.
3. Define succulence.
4. What are the principal food substances obtained from roots?
5. Suggest combinations of vegetables of this type with others of a different nature.
6. To increase the food value of this class of plants, what additions are desirable?
7. Mention some of the most helpful utensils for the preparation of these vegetables.
8. What are the advantages and disadvantages of paring before and after cooking?
9. Are there any vegetables of this class with which you are not familiar or have not learned to eat?
10. What substances extracted from roots have commercial value?

[Vegetable Foods, Bul. 245.]

COURSE IN VEGETABLE FOODS.

SEVENTH LECTURE—FLOWERS AND FRUITS.

FLOWERS AND PRODUCTS MADE FROM THEM.

Most flowers are too delicate in structure to be of much value as foods, yet some are cooked occasionally.

While flowers are attractive ornaments on or near the table, highly scented ones should not be allowed in the dining room, as their odors rarely combine well with the odors from cooked foods.

The fashion of serving salads in roses or molding blossoms in jellies can not be commended. Nasturtium flowers are occasionally used to garnish a salad, and since they have a flavor like water cress are sometimes eaten. The buds are occasionally pickled. Orange flowers are well-known ingredients of cakes, creams, and confectionery, being added for the flavor which they impart. Saffron and marigold petals once were considered important adjuncts in cookery, chiefly for the yellow color they imparted, and are often mentioned in old recipes for soups, etc. In southern Europe squash blossoms and the tiny squash to which the blossom is attached are dipped in batter and fried, and elder flowers also are used for fritters. Cooked squash flowers may be folded in an omelet. But such things have little food value in themselves.

Sometimes rose petals, violets, and mint leaves are candied, but are used more for garnishing than for food purposes. Rose petals in the Orient are used for making a very sweet preserve. Many other blossoms serve as food, chiefly in the Tropics, but need not be mentioned further.

Capers.

Capers are unexpanded flower buds of a tropical plant packed in vinegar. Cloves are also flower buds picked before expansion and dried.

Cauliflower.

As has been shown (see p. 29), the portion of the cauliflower that we eat is the flower head, and we discard root, stalk, and leaf, though the white midrib of the leaf may be cooked also. (Reference No. 18, p. 15.)

Globe Artichoke.

The French or globe artichoke is, next to the cauliflower, the most important example of the use as food of this portion of the plant.

It thrives in southern Europe and the southern and central United States, but is not hardy enough for cold climates. The base of the flower head and the scales are thick and fleshy and have a delicate flavor if used before fully opened. (Reference No. 49.) The simplest method of preparing them is the best. (Reference Nos. 18, pp. 19, 20; 75, pp. 99, 100.) Remove the stalk and under leaves and cut off tips of leaves. The flower heads may be eaten raw when very young, but commonly are soaked and parboiled in salted water until tender even when used as a salad. When done the leaves will separate readily. The "choke" is the fibrous center which should be scraped out with a spoon after cooking. The individual "leaves" are pulled off and eaten with a sauce or dressing. The bottoms or artichoke "buttons" may be dipped in batter and fried in deep fat or covered with force meat and then baked like stuffed tomatoes.

The cardoon is allied to the globe artichoke, but is little used in the United States.

Honey.

Honey (Reference Nos. 2; 41) may properly be classed among the food products derived from flowers. In ancient times, before cane sugar was manufactured, it was the principal sweet, and to-day it is still much prized. A study of its history and folklore is interesting.

The varying qualities of honey derived from different flowers are worthy of note. That obtained from white clover fields is of fine flavor and light color; raspberry plantations furnish a good quality, while buckwheat gives a dark color and a flavor which some do not relish; and certain wild plants, such as mountain laurel, may impart poisonous qualities to the honey made from them. Many races made fermented beverages from honey, mead for example. Recipes which have been handed down for generations are still used for honey cakes and cookies.

Certain medicinal virtues are attributed to honey, and it has been the basis of many remedies for coughs and colds because of its detergent and soothing properties.

Colors and Flavoring Extracts.

Flowers find a considerable use in cookery for coloring and flavoring purposes. Dried saffron flowers, as already mentioned, are employed for coloring foods yellow. Violets are used in a similar way for imparting a purple color, while a number of other colors are made from blossoms or leaves. Some highly prized flavoring extracts are made from flowers; for instance, rose extract, orange-flower water, and sirup of violets. Nasturtium flowers are used like tarragon for flavoring vinegar, and other similar uses might be cited.

FRUITS USED AS VEGETABLES.

(Reference No. 21.)

The fruit of a plant, botanically, is that portion in which the seed is perfected. In popular language, the distinction between a fruit and a vegetable is not easily made, and on the border line are several important food plants which have been called vegetable fruits. Such are tomato, eggplant, peppers, melons, cucumbers, squash, etc.

The gourd family, or Cucurbitaceæ, includes many of the true fruits used as vegetables. This family furnishes the largest fruits of any known plant, some being over 8 feet around and weighing more than 200 pounds. The squash, both winter and summer varieties, the pumpkin, vegetable marrow, cucumber, and melons belong to this family, and each may be used in several ways. Some varieties were known in Egypt and Persia from the earliest times, and squashes or pumpkins, the "pompions" mentioned by some of the early writers in this country, were raised by the American Indians before the white men came.

The water in these fleshy seed receptacles may be shown by slicing and sprinkling with salt and leaving overnight. Then drain, weigh, and compare the result with original weight.

Pumpkins and Squash.

There is great variety in texture and flavor of the individual specimens of the same kind of either squashes or pumpkins, but careful cooking will modify these differences. The best are heavy in proportion to their size, having thick rather than thin flesh. Where the fibers are coarse, long cooking and straining will reduce them, and an excess of water may be evaporated. Where the shells are hard, bake or steam and then scrape out and mash the flesh.

The cooked, strained pulp of squash or pumpkin is sometimes combined with milk or stock for soups or with custard for pies, or is added to doughs like those of corn bread or muffins, or may be cooked with sugar and spices for marmalades. (Reference No. 75, p. 51.)

The summer squash is often not fully appreciated because often allowed to grow too large. Either variety, crookneck or turban, should be so tender that the seeds and skin are edible when cooked. Summer squashes may be cut in slices and fried, though they are most commonly boiled. When fully grown they may be used like winter squash, skin and seeds being removed. (Reference No. 18, p. 37.)

Cucumbers and Melons.

These fruits long have been popular with the human race as a means of supplying water in a clean and wholesome form, as well as for food. When stale, wilted, or overgrown, the cucumber may in-

terfere with digestion, but a fresh, young specimen, thoroughly peeled and left in cold water (sometimes salted) before serving, loses its bitter juices and is a palatable and usually healthful relish.

The cucumber may be served as a salad by itself or to accompany fish or meats, or may be grated to add to rich sauces. It may be cut in strips, cooked, and served on toast like asparagus, and in other ways. The skin and seeds may be removed and the firm flesh used as a case for salads or, like pepper and tomato, it may be filled with forcemeat and baked. (Reference No. 16.)

Melons rank with fruits. The common varieties are almost never cooked but are eaten as they come from the garden. The use of melon rinds and melons in their unripe state will be considered under pickles. (See Lecture 14.)

Peppers.

The fleshy seed vessels of many peppers are used not only for their condimental value, but as a receptacle in which to serve other food. The southern green peppers, a variety which lacks the "hot" characteristic of common garden green peppers, may be found in the city markets most of the year at 2 cents to 5 cents each, and are used increasingly either stuffed and baked or as an ingredient of omelets, soups, and salads.

The stem and seeds of the green pepper are removed together by cutting around the stem, and this portion may be used for flavoring soups. The seeds themselves are likely to be hot, and are considered indigestible. The thick section to which the seeds adhere may be trimmed and cooked with the peppers.

If the peppers are small and fresh, they may be chopped or sliced thin and used raw in salads or as a garnish. Often they are better for parboiling. If put in a hot oven or on top of the stove for a few moments, the skins may be pulled off.

The canned sweet Spanish red peppers (pimmentoes, see p. 56) may be used in similar fashion, and may be obtained from any large grocery store at moderate prices. These peppers are valuable because they make tasteless foods savory and attractive. (Reference No. 18, p. 36.) Paprika is prepared from peppers of this mild type (see Lecture 10), red or cayenne pepper from "sharp" or "hot" varieties.

Okra.

This plant grows best in warm climates, though it may be grown as far north as New England. (Reference No. 13.) Dried and canned okra is obtainable in most markets, and the fresh pods are common in many large markets in regions where the plant is not raised.

The pod and seeds are used together, and usually are sliced cross-wise and cooked till tender. It may be used alone, but is more often added to watery soups, as its mucilaginous nature serves as thickening. (Reference No. 18, pp. 36, 42.)

Eggplant.

This plant has long been known, but is less generally used than many vegetables. It belongs to the same family as the potato and tomato—the nightshade family. As is the case with all succulent vegetables, its nutritive value is not high, but it is palatable and much liked by many. It may be cut in two, stuffed and baked, or in slices, crumbed and boiled or fried. (Reference No. 18, pp. 36, 37.)

Tomato.

Though probably a native of America and known in Europe since the sixteenth century, the tomato was slow in coming into favor, possibly because of supposed poisonous qualities. It has been generally used in this country for less than a hundred years, but its growth in popularity has been rapid.

To this vegetable fruit we owe much in cookery. Alone and in combination it provides soups, sauces, and salads, and many relishes which make many mild-flavored materials appetizing. The sour taste of the tomato is due chiefly to citric rather than oxalic acid. (Reference No. 60, p. 243.)

When tomatoes are served raw the skin is very commonly removed, and this is particularly desirable in the case of tomatoes which have tough skins. The peeling may be easily removed if the tomatoes are plunged into boiling water for less than a minute, then drained, and chilled over ice, if possible. They may be peeled when needed. Perfectly ripe tomatoes may be scraped with the back of a knife to loosen the skin, which then will peel easily, but this is less rapid than the scalding process. If cooked tomatoes are to be strained, it is unnecessary to peel them before stewing, as the skin will remain in the strainer with the seeds. Some persons believe that immersion in hot water injures the appearance and flavor of the tomato and peel them without this treatment. Many persons prefer to serve tomatoes unpeeled, particularly the hothouse tomatoes or other varieties with thin, tender skins. If this is done, the tomatoes should always be carefully washed in order that they may be free from any dirt accidentally present. The very small red tomatoes which grow in clusters and are known as cherry tomatoes, often found in large markets, are very attractive for salads, and the yellow plum tomatoes are perhaps always eaten without peeling.

Bananas.

Like the tomato, the banana may be regarded as a kind of connecting link between vegetables and fruits. The under-ripe banana especially may be baked or fried like the potato or yam and served with meats. A satisfactory and simple way to cook bananas is to remove the skin, scrape off the rough outside, cut large ones in two across, dip in egg and crumbs, and fry brown in deep fat.

EXPERIMENT AND PRACTICE WORK, SEVENTH LECTURE.

Materials needed.—Three cans tomato, or fresh tomatoes; onion, green pepper, any other vegetable fruits in season; can opener or sardine scissors, strainer, masher, bread crumbs, butter, flour, seasoning.

Exercises.—Have canned tomato of two grades with marked difference in price. Weigh each can; weigh contents again after emptying.

* Cook each grade separately 15 minutes and strain through medium wire strainer, weigh refuse from each lot, and compare results. Estimate relative values based on cost, quality, and quantity.

Open another can of tomato and drain in strainer without pressing through. Reserve liquid for soup, use solid portion for scalloped tomatoes. (Reference Nos. 18, p. 35; 73, pp. 162-163.)

Use the strained tomatoes in any of the following ways:

- (1) Tomato toast. (Reference No. 18, p. 35.)
- (2) Tomato jelly salad. (Reference No. 73, p. 109.)
- (3) Tomato soup. (Reference No. 18, p. 41.)

Several types of tomato soup may be made:

- (a) One part tomato, one part water, with flavor of herbs, and slight thickening with cornstarch.
- (b) One part tomato, two parts water, and a little beef extract.
- (c) One part tomato, two parts milk, and seasoning.
- (4) Tomato sauce. (Reference No. 73, p. 68.)
- (5) Spanish sauce. (Reference No. 73, p. 67.)
- (6) Cream of tomato. (Reference No. 73, p. 78.)

The following processes are also suitable for this lesson if the materials are obtainable:

Stuffed eggplant; summer squash sautéd (fried); winter squash, hard shell, steamed or baked; pumpkin or squash pie; stewed cucumbers on toast; cucumber and tomato salad; eggs poached in tomato sauce; stuffed peppers or tomatoes; squash biscuits (Reference No. 73, p. 31. See also p. 41).

REVIEW QUESTIONS, SEVENTH LECTURE.

1. What have you to say regarding the association of flowers with food?
2. Have you ever seen flowers used in a way that seemed unsuitable?
3. Tell something of the source and preparation of capers and cloves.
4. What product from flowers does the human race obtain through insects?
5. Describe a fruit.
6. Mention five so-called vegetables that are strictly fruits.
7. Mention several members of the gourd family that have been used from ancient times.
8. Tell something about the tomato plant, its family and characteristics.
9. Give a list of dishes where the tomato is useful.
10. Mention any other flowers and fruits used chiefly for condimental purposes.

COURSE IN VEGETABLE FOODS.

EIGHTH LECTURE—SEEDS.

For the structure of seeds see Reference No. 80, pages 257, 275.

In the higher plants nature's most usual method for the perpetuation of the species is by means of the seed. Seeds contain the embryo from which the new plant develops and almost always a store of nutritive material for the growth of the new plant for a longer or shorter time after the seed has sprouted. The stored material varies in different plants; thus in such nuts as the walnut, oil is very abundant, while in the cereal grains it is chiefly starch which is stored. Seeds are usually protected by a hard outer covering like the bran layers and skin of wheat kernels, the skin of the peanut, or the shell of a nut. Frequently there is additional protection, as the husks on an ear of corn, the pod in which beans or peas grow, or the outer thick covering of a walnut.

Taken together, seeds constitute one of the most important food groups, as is evident when we consider that numbered among them are the cereal grains and beans, peas, and other legumes, as well as nuts and the oil-bearing seeds such as cottonseed and sesame seed.

Many seeds besides those used as foodstuffs are important; for instance, those prized for their aromatic flavors, such as allspice, cardamom, and caraway.

The cereal grains have been considered at length in an earlier bulletin of this series (Reference No. 34), and aromatic seeds in the chapter which deals with spices (p. 68). The pulse family, which includes a number of our most important vegetables, is considered in the following section.

The Leguminosae or pulse family (Reference No. 5) includes some of our most important food plants. The bean, lentil, and pea have been recognized in all ages and in all lands as substitutes for both bread and meat, and for the human race come next to the grains in general use. A Hindu proverb indicates the nutritive value of this type of food thus: "Rice is good, but lentils are my life."

The principal objections to a more general use of this class of foods are that their flavor does not appeal at all, and that they have been found a cause of digestive disturbance under certain conditions.

So far as the natural flavor is concerned, it is often wise to remove a portion of it, even if this means also loss of substance, by occasionally changing the water in which the beans are soaking or in

the early stages of cooking. There might be far more use of added flavors than is customary. Mint, parsley, onion, etc., often are cooked with green peas and beans, and their use would seem more needed with the dry ones. Other herbs and sweet peppers or pimientos, either green or red, also may be used to give variety. The chef sometimes uses bay leaf, clove, and nutmeg, but these must be added sparingly. We have much to learn from the Mexicans in their use of beans in combination with meat. (Reference No. 29, pp. 24, 25.)

BEANS, PEAS, AND LENTILS.

Such beans (Reference No. 30, pp. 15, 16) as the navy bean and Lima bean contain relatively little fat. They do not grow rancid like grain products, but the older they are the harder to make them palatable and soft and the longer the processes of soaking and cooking.

The long soaking of leguminous seeds is an important factor in their cookery. It took a long time for the seed to ripen and dry in the pod on the vine and it loses rather than gains water in the store and house. Therefore it is reasonable that considerable time will be required to fill out the cells of such a dense substance with water. Where there is no danger of fermentation, beans, etc., may be profitably soaked for even 48 hours. Pick over, wash well, add nearly 1 quart of water for 1 cup of beans, and set in the refrigerator or other cold place. The water may be changed, if convenient, after 12 or 24 hours. This serves to remove any rank flavor. (Reference No. 74, pp. 87-89.) It is said that in eastern countries lentils are soaked a long time for this purpose.

After this complete filling of the tissues with water the time required for cooking will not be much longer than for shelled beans fresh from the garden. True, there has been some loss of substance, but a corresponding gain in palatability. Soft water is preferable to hard both for soaking and cooking. (Reference Nos. 62, pp. 119, 120; 65, pp. 7, 62; 82, p. 234.)

Since the proper preparation of legumes is a long process, it is well to cook enough to serve in two or more fashions. Thus the baked beans often are reheated or served cold, and the final remainder used in soup. So, too, the dry Limas or red kidney or any variety may first appear as plain buttered beans, a further portion, prepared at the same time, be reserved for salad or croquettes, and any still remaining be utilized as a soup. (Reference No. 103, pp. 213, 214.)

Lentils are not as generally used in this country as they deserve to be. They may be found in the markets of foreign sections of large cities and in the larger groceries. The price is about the same as that of dry beans and peas. There are many colors, as with beans.

Esau's pottage is supposed to have been made from red lentils. Sometimes they are served like peas or with a seasoning of fried onion. Sometimes soup or purée is made from them.

Revalenta or ervalenta are forms of lentil flour. In some parts of Europe a kind of bread is made from ground lentils.

The use of bicarbonate of soda in the preparation of legumes is often decried, and it certainly should be employed with moderation, nevertheless it serves a useful purpose in making the skins more tender, and probably also forms new combinations with or neutralizes substances which tend to produce indigestion or flatulence. (Reference Nos. 5, pp. 23, 24, 31, 32; 103, pp. 217, 218.) The addition of the potato or onion to the pot of beans before baking is doubtless an instinctive attempt to supply flavor lacking in the bean. In the same way East Indian cooks have learned to season their beans with asafetida, which is also thought to prevent flatulence. These phases of vegetable cookery have not as yet been studied sufficiently to warrant positive assertions, but the instinct of primitive people is often verified by scientists.

The use of fresh, young peas and beans is extensive, the seeds being sometimes served alone, and often with the succulent pod containing them. The pods of peas are ordinarily discarded, but sometimes they are cooked for a while, and then the water in which they were boiled is used for cooking the peas themselves. There are also edible podded peas.

"String" or "snap" beans, if young and tender, may be cooked quickly. If old and well grown they need longer cooking than is often given them. If overgrown they will be improved by parboiling for a few minutes in water to which soda has been added, about one-fourth level teaspoon of soda for 2 quarts of water. They should then be drained and cooked in fresh water. A combination of string and shell beans is a pleasing change from either alone. String beans appear to be more readily digestible if cooked uncovered. (Reference No. 18.)

The large green pods of the red or cranberry beans remain tender until the seeds are nearly full grown, making them among the best types of string beans.

In the Southern States cowpeas or field peas have been grown for many years as a fertilizer and for food for animals and man. These have a distinctive, pleasant flavor, are used green and dry, and are cooked like other peas or beans. The young pods are excellent as "snap beans."

Chick-peas are used extensively in southern Europe, and may be found in the foreign markets in our large cities.

The Mexican frijole is another type of bean the use of which might well be extended.

The people of the Far East have cultivated many varieties of legumes that are not so well known elsewhere as food for man, though much use is made of them in the United States, particularly as forage crops. The soy bean from China and Japan differs from other common varieties in containing considerable fat; it is used in making special types of so-called bean cheese or bean curd and for sauces of agreeable flavor. (Reference No. 5, p. 13.) The adsuki bean from the same countries is very prolific, and may be grown in this country. Its seeds are smaller than even the pea bean, but when prepared in the same fashions seem not unlike other legumes. These beans are often combined with rice by the Japanese.

Some experiments recently have been tried, using a flour made from soy beans in bread making with an equal proportion of wheat flour. Such bread, it is claimed, has an advantage, particularly for diabetics, in furnishing less starch and more protein than that made from wheat flour alone.

Condensed foods for explorers have been made consisting largely of legumes. The "erbwurst," or pea sausage, was very useful to the German Army in the Franco-Prussian War. Of this, Mrs. Abel says (Reference No. 5):

It was invented by a cook, and the German Government bought the secret of its preparation. It consists of pea and lentil flour well cooked, evaporated, and mixed with a proportion of bacon, the proper seasonings, and some preservative. Mixed with hot water, it made a very nutritious soup for the soldier. It was found by the German Army to be invaluable, if used only in emergencies, but its continuous use brought on digestive disturbances and the eater soon tired of its taste.

A flour of beans and peas may be obtained, but the soups resulting are not always as palatable as those properly made direct from the seeds themselves.

PEANUTS.

Peanuts assumed little commercial importance until after 1865. About this time their use became general all over the United States. (Reference No. 5, pp. 25-26, 35-36.) Even now their food value is not popularly appreciated, though the demand for peanut butter increases. In this form the peanut is available for use in sandwiches, salad dressings, and soups.

Some households find it wise to buy raw peanuts and roast them as needed. Overroasted peanuts are undesirable both as to flavor and digestibility. Raw peanuts are sometimes eaten, and are relished by many if well ripened and cured. They are often said to be difficult of digestion.

The peanut butter may be made as wanted at less cost and of superior quality to much that is sold in the markets by putting the

roasted and shelled nuts through the meat chopper. The name is justified by the large amount of fat which the peanut contains, and which differentiates it from other legumes.

COTTONSEED.

Cottonseed meal is being experimented upon for human food. It has long been used for animals. The meal or flour remains after the oil has been extracted. Cottonseed oil is used in many ways like olive oil and similar oils, and in the manufacture of culinary fats.

CEREAL SEEDS AS VEGETABLES.

Wheat, Oats, and Rice.

The seeds of the common cereals are often used in preparing dishes served as vegetables, as, for instance, boiled rice, macaroni dishes, oatmeal fritters, farina cake, etc. (Reference No. 34, pp. 34-38.)

Cereals do not possess very distinctive flavors, so it is a common practice when using cereal products in this way, to season the dishes highly with cheese, with tomato, or with onion, or else to cook the dishes in ways which will give flavor, as for instance, by browning in fat. Rice cooked with tomatoes, macaroni with cheese, and noodles seasoned with fried onions, are familiar examples of well-seasoned cereal dishes made tasty by the use of seasoning, while rice croquettes, mock oysters (made of oatmeal), and farina fritters are examples of foods made savory by browning in deep fat.

Corn.

Corn is a native of the New World and had been cultivated for centuries before America was discovered. Originally a tropical plant, it had been developed and changed by selection and culture until it would mature a crop as far north as Montreal, a remarkable achievement for an uncivilized people.

Corn is commonly regarded as a distinctively American foodstuff, but it was long ago introduced into other countries and is now extensively used in the Mediterranean regions of Europe, in Africa, in Australia, and in China. In the United States it is—as it has been since Colonial times—a staple and very important foodstuff.

Corn serves in more forms as a vegetable food than perhaps any other grain. (Reference No. 23.) The Mexican uses the corn husk to wrap the combination of corn, meat, and seasoning known as tamales. The hulled corn or lye hominy is used not only as a breakfast cereal but also as a vegetable, and so is the cracked corn or hominy. (Reference No. 14.)

But the sweet or green corn is most used and is one of the most highly esteemed of American fresh vegetables. Enormous quantities

are eaten fresh, and its canning is a great industry. The ears are roasted or boiled and served on the cobs; or the raw or boiled corn is cut from the cob and stewed or fried alone or in combination with beans, tomatoes, potatoes, etc., or served in soups or salads. (Reference No. 23, pp. 34-37.) Corn cut from the cob is sometimes used in making pickles or relishes. The very young cobs are also pickled (see p. 88).

Buckwheat.

Another seed of importance is the buckwheat, which in reality is not a wheat at all, but is a near relative of sorrel, dock, and bindweed. (Reference No. 54.) It has been used for centuries in most countries of the Old World where grains are cultivated. The pancake or griddlecake made from this flour is a distinctly American product. A sort of biscuit or shortcake or shortbread was a rather common dish in earlier times in the United States. In the Old World, notably in Russia, buckwheat is much used for making porridge. (Reference No. 34, p. 55.)

EXPERIMENTS AND PRACTICE WORK, EIGHTH LECTURE.

Materials needed.—Dry beans and peas of as many varieties as are obtainable, such as white pea, yellow eye, red kidney, black, Lima, green flageolet beans, whole, split yellow, split green peas, lentils, approximately one-half pound each; flour of beans, peas, and lentils; peanut butter; cans of green corn, peas, and of Lima or red kidney beans, or both; butter or other fat, milk, seasoning. For analysis of peas and beans see Reference No. 30, pages 65, 67.

COMPARISON OF FRESH, DRIED, AND CANNED LEGUMES.

When possible secure green peas or beans in the pod, measure and weigh (1) as purchased, (2) after preparation for cooking, (3) after cooking, and estimate percentage of loss and actual cost per person. Keep a record of the time required to string the beans or shell the peas.

Compare all results regarding cost with those from canned peas and beans, using care in separating the liquid from the latter.

Taste the water in which fresh green peas are boiled and note its sweetness; allow it to evaporate until just enough remains to serve with the peas. Taste the water from canned peas; if agreeable in flavor, do not throw it away. Note the difference in the water from string beans.

Lima Beans.

Weigh and measure the dried beans, wash, soak, and leave 24 hours; weigh again; if feasible, leave 12 to 24 hours longer and again weigh to see how much they swell after the first; measure and compare with original bulk. Compare also with contents of Lima beans. It is a good plan to count the number of beans in the can and compare with the cost of the same number of dry ones.

If Lima beans are not available, try the same experiment with any kind of beans available.

Dry Lima beans may be cooked until the skins are tender. The beans are so large that it does not take long to slip off the skins by hand after parboiling. The skinned beans may then be cooked and served much like mashed potato, with addition of fat, salt and pepper, or may be used for croquettes or soup. Or some of the beans which retain their shape may be rinsed off and served with lettuce and dressing for a salad.

In connection with this use of Lima beans it is interesting to note another use of legumes in salad dressing. Peanut butter reduced with lemon juice or water and vinegar and seasoned makes an excellent salad dressing. Cotton-seed oil, peanut oil, and a number of other seed oils, when rightly made and refined and fresh, are palatable in salads used in the same way as olive oil.

Baked Beans.

Baked beans are not easily managed in short experimental periods, but their study may be accomplished in lessons on successive days. Soak the beans 12 to 24 hours, and then parboil. Let them be well started in the baking process, and then transfer to a fireless cooker (Reference No. 34, p. 33), where they may remain till the next day. At the beginning of the next lesson put them in a hot oven and bake two or three hours more. By this plan a fairly good result will be obtained. (Reference No. 18, p. 26; 73, pp. 147, 148; 71, p. 67.)

Cowpeas.

The cowpea, or field pea, as it is sometimes called, is commonly grown in the Southern States. Cowpeas may be used in place of other legumes in practice work, if more convenient, or may be used in addition to them.

The cowpea requires a longer season to mature than the kidney bean and so is seldom found in northern markets, though it might well be generally introduced on account of its distinctive and agreeable flavor. The tender cowpea pods can be cooked like string beans, the underripe peas shelled and cooked like green peas or green beans, while the dry peas may be used in various ways for making soups, croquettes, fritters, and other dishes.

Baked cowpeas may be prepared according to the directions given above for baked beans, or the dry cowpeas may be covered with luke-warm water and parboiled slowly for several hours until a little soft, at one lesson; and then at the next period, transferred to the bean pot, seasoned with salt pork and other seasoning if desired and baked slowly for about 6 hours. (Reference No. 5, p. 11. For additional data, see U. S. Dept. Agr., O. E. S. Bul. 187, "Studies on the Digestibility and Nutritive Value of Legumes at the University of Tennessee, 1901-1905;" Tuskegee Norm. Ind. Inst. Expt. Sta. Bul. 5, "Cowpeas.")

To accompany this lesson one of these menus might be prepared:

1.

Soup—Green split peas. (Reference No. 73, p. 178.)

Baked beans. (Reference No. 73, p. 147.)

Apple and onion salad with peanut-butter dressing.

2.

Peanut soup. (Reference No. 73, p. 80.)

Spanish beans. (Reference No. 73, p. 148.)

Green pea timbales. (Reference No. 73, p. 156.)

String bean salad.

Peanut cookies. (Reference No. 73, p. 210.)

3.

Cream of corn soup.
Succotash, or
Corn fritters, or
Hominy croquettes.
Baked Indian pudding, or
Cornstarch blanc mange.

REVIEW QUESTIONS, EIGHTH LECTURE.

1. Describe seeds of different types.
2. Why do seeds contain more concentrated nutritive material than other parts of plants?
3. What groups of seeds are most important for human food?
4. Describe two principal types of leguminous plants.
5. What is the main difference in composition between dry beans and fresh shelled beans?
6. Explain the addition of fat meat in baking beans.
7. What uses have been found for cotton seeds?
8. What can you say of buckwheat, its characteristics, growth, and uses?
9. Mention points in favor of and against grinding peas, beans, etc., into a flour before using them for soups.
10. Compare canned and dry beans as to cost, labor of preparation, and quality.

[Vegetable Foods, Bul. 245.]

COURSE IN VEGETABLE FOODS.

NINTH LECTURE—FUNGI.

There are many plants quite unlike those already studied, in that they contain no green coloring matter or chlorophyll and are flowerless. This class of plants is called by the Latin name fungus, and includes many curious specimens of varied sizes, forms, and colors.

A characteristic of this type of plant life is that it draws its subsistence not directly from the earth, but from other organic matter. (Reference No. 53.) There are thousands of species thriving either on the living tissues of their hosts or on the cast-off cellular matter of the latter. Some, like the molds, are very minute, while puffballs and toadstools have been found from 1 to 2 feet through.

MUSHROOMS, ETC.

Many of the larger types of fungi are popularly grouped together as mushrooms. (Reference No. 46.) Some of these are extremely poisonous; others are harmless, but of no particular culinary value, while there are many edible varieties much esteemed for their delicate and peculiar flavor. Every country dweller fond of mushrooms might well learn to recognize the common mushroom (*Agaricus campestris*), the shaggy mane (*Coprinus comatus*), the ink cap (*Coprinus atramentarius*), the parasol (*Lepiota procera*), the chanterelle (*Cantharellus cibarius*), the morel (*Morchella esculenta*), the liver or beefsteak fungus (*Fistulina hepatica*), the fairy ring (*Marasmius oreades*), the giant puffball (*Lycoperdon giganteum*), and others. (Reference Nos. 50 and 95.)

Many of the edible mushrooms prove a cause of gastric disturbance, or irritating to the digestive tract, if used when past their prime. None of the common tests of silver spoon, etc., for poisonous varieties are safeguards, but if the fungi are gathered with due caution, to include only wholesome kinds, many a savory morsel may be enjoyed. Even around an old tree trunk in a large city more than one dish of ink caps has been secured.

Mushrooms should be gathered without the adhering earth, the stems broken rather than pulled, for once sand is scattered through the gills it is hard to remove. (Reference No. 1, p. 12.) First wash by floating in water, gills down. Young or button mushrooms need

not be peeled, but old ones should have the skin removed, pulling it from the circumference to the center.

The common market mushroom (*Agaricus campestris*), which is often found growing in old pastures, is the only kind commercially cultivated in this country. It grows 2 to 3 inches high, has a cap about as wide when fully expanded, which is a brownish white above and sometimes tinged with pink below. The color deepens as the mushroom grows older, but even when it is fully expanded and quite dark the flavor is good. It may be purchased canned, but is much better fresh, and may be grown for home use. (Reference Nos. 1, 12, 53, 95.) Dried mushrooms of various kinds may be bought in some of our large markets and in the small stores in the foreign quarters of our large cities. The fairy ring and parasol varieties may be easily dried and kept indefinitely at home. They should be freshened, like any dried vegetable, by soaking until they have regained their natural size.

Many recipes for cooking mushrooms call for the removal of the stems, but they may be used if not too woody. It is a good plan to slice them crosswise and cook for a few minutes previous to adding the caps, or the stems may be reserved for flavoring soups or sauces.

The food value of the mushroom is often rated higher than it deserves, partly because the analyses of the fresh and dry have been confused. (Reference No. 3.) The average composition of the fresh material is as follows: Water, 88 per cent; protein, 3.5 per cent; fat, 0.4 per cent; carbohydrate, 6.8 per cent. (Reference No. 57.)

These figures are comparable to those for milk as regards water and protein, but the fat is much less—more like that in skim milk—and the carbohydrate content is higher. The special value of the mushroom, however, is not as a source of nutrients, but as a flavoring for otherwise tasteless viands. (Reference No. 40, p. 365.)

The truffle, an underground fungus growth much esteemed for its flavor, has been called the “diamond of the kitchen” and a “sample of Paradise” by French epicures. (Reference No. 87, pp. 383-396.) It was known to the Greeks and Romans, but had its greatest vogue in Paris early in the nineteenth century. Dogs and pigs have been trained to hunt for truffles, and their presence is also indicated by insects which are attracted by their odor. The canned truffles available here seem to many not worth the price demanded for them.

MILDEW, MOLDS, AND FERMENTS.

These also are classed under fungi. Some of them are looked upon as enemies, yet many of the characteristic and delicious flavors in butter, cheese, fruit cakes, and pickles are due to the development of such fungi. (Reference No. 59, pp. 51-57.)

YEAST.

Yeast is a microscopic plant of the fungus type. It will grow without light, but like any plant it must be kept moist and warm. It will grow in a wide range of temperatures from just above freezing point to over 120° F. (Reference No. 96, ch. 34.) Though formerly commonly prepared at home, yeast for bread making and similar purposes is now very commonly purchased ready prepared. (Reference Nos. 63, pp. 7-39; 71, pp. 79, 80, 82; 85, pp. 184-191; 97, pp. 161-163.)

In connection with bread making it is worthy of notice that most of the chemicals used to leaven quick breads are of vegetable origin, though not living organisms like yeast. Soda is commonly produced from ash of vegetable substances. Cream of tartar is a deposit from the juice of grapes formed on wine casks during fermentation. Occasionally it is found in the dregs of grape juice. Since this is an expensive article, other substances often are used in its place. (Reference Nos. 61, pp. 147-154; 62, pp. 23, 36-39; 65, pp. 89-92.)

EXPERIMENT AND PRACTICE WORK, NINTH LECTURE.

Materials needed.—The materials needed include mushrooms, fresh, dried, or canned, pieces of rotten or moldy apple or other fruit, and either yeast cakes or liquid yeast.

Mushrooms.

Prepare fresh, dried, or canned mushrooms with white sauce or use in soups.

Mold and Decay.

(1) Cut through the skin of some vegetable or fruit with a knife dipped into mold or decay from another fruit. Watch day by day for changes.

(2) Put a whole fruit or vegetable and a piece of bread in a sterile jar, cover, and set away.

(3) Scatter spores of mold in a jar and then put in the jar a bruised fruit or vegetable and piece of the same bread. Cover and leave for several days beside the other jar. (Reference Nos. 34, p. 60; 59; 62, pp. 73-75, 77, 78; 63, pp. 33-38, 109-116; 85, Ch. XVI.)

Yeasts and Fermentations.

(1) Experiment on the effect of temperature (from Reference No. 71, p. 79). Blend one yeast cake thoroughly in a pint of water to which has been added 1 tablespoon of sugar.

(a) Freeze a portion of the mixture, then allow to thaw at room temperature.

(b) Boil another portion and cool to room temperature.

(c) Take a third portion at room temperature

(d) Chill a fourth portion.

Fill bottles from each of the above and invert them on plates. Keep (a), (b), and (c) at 32° to 37° F. and (d) packed in ice during the remainder of the laboratory period. Explain results observed.

(2) Molasses and yeast. (Reference No. 59, exp. pp. 21-29.) For further experiments see Reference No. 59, pp. 30, 31, and Appendix, pp. 267-285.

Yeast muffins, etc., may be made in the usual way and also with the addition of strained pulp of fruit or vegetables, such as white or sweet potato, apples, squash, or pumpkin, and mashed parsnips. These may be used interchangeably. (Reference No. 73, p. 31.)

If there is time in connection with the lesson, breads should be made wholly or in part with flours made from bananas, chestnuts, potatoes, soy beans, or such other substances of like vegetable origin as can be secured.

Some writers on cookery consider such addition as adulterations of bread, but they deserve recognition for the variety thus afforded. (Reference Nos. 34, pp. 42-44; 72, pp. 125-129; 74, pp. 101-108.)

REVIEW QUESTIONS, NINTH LECTURE.

1. What are the characteristics of fungi?
2. Describe any mushrooms you know to be edible.
3. Can you describe any poisonous fungi?
4. How do mushrooms rank in nutritive value?
5. What effect have such fungi, as mold, etc., on foods?
6. What is the source of the various leavening agents used in breads, etc.?
7. Tell all you can of yeast, its nature, method of use, etc.
8. What vegetables are sometimes combined with flour for making bread?
9. How may we guard foods from ill effects of molds and fermentations?
10. What forms of fungi commonly attack fabrics?

[Vegetable Foods, Bul. 245.]

COURSE IN VEGETABLE FOODS.

TENTH LECTURE—CONDIMENTAL VEGETABLE FOODS AND FOOD ACCESSORIES.

The value of appetizers or food accessories is generally recognized. (Reference No. 60, pp. 274-275.) The Germans class these with others under a convenient title "Genusmittel," or "means of enjoyment," "pleasure giving." The words condiment, herb, and spice are used somewhat indiscriminately, but together refer to various vegetable products used in small quantities to add flavor where it is lacking or to develop natural flavors in food. (Reference No. 74, p. 130.) The terms may include such vegetables as radishes and water cress, which are served in their natural state; flavoring materials, such as spices, savory herbs, and extracts used in general cookery; and prepared sauces, pickles, etc., in which some mild-tasting material usually serves to carry a combination of flavors. In whatever form they may finally appear, the majority of these flavors are due to the volatile oils or similar bodies developed in the plants from which they were obtained.

The actual quantity of these articles in any one dish is usually so small that their nutritive value can hardly be counted, but in the total estimate they are important, because they may make otherwise insipid or monotonous foods more palatable and so render them more digestible.

Beverages like tea and coffee, such materials as sugar and oil when used mainly for flavor, vinegar, and other food accessories, are also considered in this lecture.

CONDIMENTAL VEGETABLES AND PREPARED RELISHES.

Under this head may be included many vegetable products, such as peppers of various sorts, mustard, and horseradish (Reference No. 61, pp. 130-134), and a host of preparations or compounds designed to give zest or enjoyment to the act of eating and to aid digestion. Various pickled fruits and vegetables, the preparation and use of which is discussed in a later lecture (see p. 88), should be mentioned in this connection.

Some materials of East Indian origin, such as curry, chutney, catsup, and tamarinds, are well-known relishes. Tomato, apple pulp, etc., are likewise used as a medium for combining many spices and

condiments. Cassareep, made from the juice of manihot roots, the poisonous property of which has been rendered harmless by boiling, is a thick, black fluid used as the basis of some potent table sauces. Mushroom and walnut juices are used for the same purpose. Sassafras leaves, when young and tender, are used in some localities to thicken soups, etc., and, like okra, supply a mucilaginous material.

FLAVORING MATERIALS.

Herbs.

The herbs properly include the herbaceous or green portion of certain annuals, biennials, and perennials that are used green or dried and usually in a chopped or sifted form in sauces and stuffings. The word is also used to include the medicinal plants which once were grown or gathered and stored by every housemother. By the way of further distinction, the herbs used for flavoring were often called savory herbs, and those which were cooked for use alone were called pootherbs (see p. 28). Among the herbs most used in the kitchen are marjoram, sage, summer savory, thyme, mint, parsley, dill, tarragon, and sweet basil. These are combined with meats or used in unsweetened dishes.

Spices.

Spices, with the exception of pepper, red pepper, and mustard, are associated mainly with sugar in common household use. Some spices, as nutmeg and mace, are used in meat dishes and with vegetables in continental cookery and much less commonly by American cooks. Cloves are also used in a limited way in meat cookery.

Other common species are allspice (pimento), cassia, cinnamon, ginger, mace, nutmeg; anise seed, bay leaves, caraway, cardamom, and coriander are less generally used. (Reference No. 102.)

Flavoring Extracts.

Vanilla is perhaps the most popular flavoring extract used in home cooking, and different qualities should be known; almond and lemon extracts, too, are common. Since true vanilla is the most expensive flavoring material, it is possible to reduce its use where economy must be practiced and to substitute other flavors and spices in small amounts. They are often used too freely, and the result is unpalatable. These three and rose and orange are made directly from the natural product, while other fruit extracts are usually made synthetically. (See also p. 50.) (Reference No. 61, pp. 143-146.)

Condimental foods are especially liable to adulteration and sophistication. There are usually several grades of the pure article and the teacher and housekeeper should know the difference. (Reference Nos. 51; 86, ch. 37.)

BEVERAGES.

Tea.

Tea has been used as a beverage from remote ages by the Chinese, and is probably in more general use than any other hot beverage. (Reference No. 97, pp. 203-207.) Leaves of many other plants have been substituted for tea, particularly in times of scarcity. The maté or Paraguay tea is a common beverage of South America, made from the leaves of a species of holly. (Reference Nos. 24; 104.)

Coffee.

Coffee has been known in Arabia and Persia from ancient times. Its introduction into England was accomplished with difficulty. The United States consumes about half of the world's supply. The amount used is not far from 1 pound per person a month. (Reference No. 61, p. 31-41.)

Chocolate and Cocoa.

Chocolate and cocoa may be classed with other beverages, though they are foods in themselves, and, as usually served, are combined with a larger proportion of milk and sugar than are tea and coffee. These are products of an American plant apparently introduced into the Old World shortly after the discovery of this country. (Reference Nos. 61, pp. 41-46; 97, pp. 210-213; 101.)

MISCELLANEOUS FOOD ACCESSORIES.

Sugar and olive oil, peanut oil, cottonseed oil, and other vegetable oils are often thought of as accessories rather than as real foods in the United States, yet they have a high value as energy-yielding foods, and this fact should be appreciated. Sugar is, of course, used in large quantities and the use of vegetable oils, though fairly common at present, may well become more general. (Reference Nos. 23, p. 14; 42; 61, pp. 104-106.)

Vinegar, which is one of the oldest condiments, may be classed as a food accessory, and has little or no food value. It will be considered further on in relation to the preservation of food materials.

EXPERIMENT AND PRACTICE WORK, TENTH LECTURE.

Flavoring Materials.

Materials needed.—Samples of spices, herbs, etc., in different stages of preparation; 2 lemons, 2 oranges, 1 vanilla bean, a few lumps of sugar, some powdered sugar, alcohol, bottles; lemon extract.

[Vegetable Foods, Bul. 245.]

Spices and herbs.—Cover the labels on the spices and see how many the pupils can distinguish by sight and taste. Other tasting contests may be arranged. Cook whole spices in water or sugar sirup and taste each combination. Try similar tasting exercises with herbs, steeping in vinegar instead of boiling in sirup.

Flavoring extracts.—Wash and dry lemons and oranges. With lumps of sugar rub surface of one of each till sugar absorbs some of the yellow flavoring oil. Cut fine, thin strips of the yellow rind only, put in bottles, cover with alcohol, and leave for several days. The extract may, after a time, be drained off and the peel discarded.

Divide the vanilla-bean and pound part of it in a small mortar with powdered sugar. Sift the sugar and keep it to sweeten and flavor. The particles of the bean removed may be steeped in milk for custards, etc. The other portion of the bean may be put in alcohol.

To test lemon extract add equal volume of water, if lemon oil is present the mixture will be cloudy.

Beverages.

Materials needed.—Any available samples of teas, coffees, cocoa, and chocolate; filter coffeepot.

Tea, coffee, cocoa, and chocolate:

1. Soak in cold water; notice color and flavor or lack of it. Bring to boiling point and again taste.
2. Pour rapidly boiling water over tea; infuse with tea ball. Let boiling water drip through coffee in a strainer or filter coffeepot.
3. Boil tea and compare color and strong flavor with that made properly as in experiment 2.
4. Boil coffee in uncovered saucepan. Note loss of aroma.
5. Any available "patent" coffeepots may be tested and the result compared with the right use of the simplest appliances.
6. Soak different grades of tea in water, unroll the leaves, noting size of leaf, proportion of stem, etc. (Reference No. 72, pp. 308-309.)
7. Test different samples of coffee for chicory and other adulterations. When mixed with cold water pure coffee floats on top, while adulterations, especially chicory, sink and give a brownish color to the surrounding water. (Reference No. 88, pp. 133, 134.)
8. Prepare cocoa and chocolate in different ways (Reference No. 72, pp. 308-310) and compare flavor, nutritive value, and cost of each.

REVIEW QUESTIONS, TENTH LECTURE.

1. What is the use of flavoring materials?
2. How does the cost of such articles compare with their actual nutritive value?
3. Give a simple classification of these substances.
4. What are some of the virtues of olive oil?
5. Have you learned to eat it and enjoy it?
6. What can you say of the food value of the three principal beverages commonly served hot?
7. What is the best method of making tea?
8. In its preparation what special points must be safeguarded?
9. What simple tests will indicate presence of adulteration in coffee?
10. Distinguish between chocolate and cocoa. Tell how to prepare each.

[Vegetable Foods, Bul. 245.]

COURSE IN VEGETABLE FOODS.

ELEVENTH LECTURE—SUMMARY OF COOKERY.

Having briefly studied some of the most important groups of vegetable foods, we are now better prepared to classify methods of cooking and see how they may be adapted to developing the best qualities of plant foods.

The chief objects of cooking vegetables are these: To sterilize any from doubtful sources; to soften or separate the woody fibers; to make the carbohydrates, etc., more accessible to the digestive juices; to modify and develop flavors; and to put in attractive form for the table.

The principal processes of cookery for vegetables are the same as for meats—baking, boiling, and frying, with their modifications; but these must be adapted to the nature of the specific vegetable. (Reference No. 74, pp. 22, 23, 90, 122.)

There are classifications of vegetables according to their botanical families and the parts of plants represented or according to their composition, as green or watery, starchy, nitrogenous, fatty, etc. In discussing the use of different varieties in the kitchen these groups are not always considered as they should be. Instead of studying the family and composition of the plant which would aid in showing the best way to prepare it, too often every type is treated in the same fashion.

For convenience of the cook, all vegetables may be classed as either the fresh, which are ready for cooking, or the dry, which must be thoroughly soaked before using, and the canned, which may be used by simply heating and seasoning, or in many other ways. Furthermore, with both fruits and dried vegetables, it should be considered whether they are strong in flavor, in which case they should be cooked in water first to remove some of their juices, or sweet or well-flavored, and to be prepared in such a way as to retain as much of their natural flavor as possible. Yet here the age and condition of each specimen must be considered, and the dividing lines between sweet and strong can not be made hard and fast; the young and perfect forms of the stronger types may be much sweeter and better flavored than old and imperfect samples of the sweet-flavored kinds. (Reference No. 70, p. 32.)

CHOOSING, SORTING, AND CLEANING VEGETABLES.

Careful choosing, sorting, and cleaning should precede any process of cookery. (Reference No. 28, pp. 24, 25.)

Medium-sized vegetables are always to be preferred to the over-large.

Plants grown slowly are liable to be tough and corky, while those having abundant moisture and sunlight are crisp, tender, and well flavored.

The shorter the time and journey between garden and table the better for green plants. It is wiser not to gather vegetables while they feel the effects of the midday sun, but rather to pick them after the dew has evaporated in the morning, or if that is not possible, in the cool of the late afternoon. (Reference No. 28, p. 33.)

Wilted vegetables can never be wholly satisfactory, but may be improved by careful washing and removal of inferior portions, and then soaking in cold water, or with salad plants by wrapping in a damp cloth. (Reference No. 28, p. 39.)

The soaking of vegetables in cold water to freshen them probably extracts some of the valuable saline matter. When they are blanched in hot water or parboiled still more mineral matter is lost. If boiled in considerable water of which no use is made, some of the soluble saline matter is wasted. This mineral matter is generally conceded to be valuable. Obviously it would be of special importance if the dietary were such that little was obtained from other sources, such as fresh fruits, salad plants, and other foods with a reasonably high ash content. It has already been indicated how the waste may sometimes be avoided by using the water for soup, scallops, etc.

Often it is convenient and wise to cook a double portion of a vegetable and serve part of it a second day in a different form. This should not be attempted in warm weather unless a refrigerator is available. Ordinarily a vegetable well salted while cooking and drained and cooled quickly will keep 24 or 48 hours in cool weather.

Enough potatoes may be cooked to serve as plain boiled or mashed to-day; while the firmer ones are reserved to broil or grill in slices, fry, or cream the next day. When gas is the fuel this is worth while, for it would take 30 minutes to boil fresh potatoes and only 10 minutes to reheat them. For use of fireless cookers with vegetables, see Reference No. 89.

Most vegetables are lacking in fat, so we contrive to add it in some form while preparing them for the table or to serve them with fat meats, etc. So far as the need of the human body goes, it makes little difference whether this fat is in cheap or expensive form, whether the vegetable is cooked with fat or dressed with cream or salad oil; one form may be more agreeable to some than another, or some fat may be less rapid in digestion, though that is a point on which little reliable information is available.

. Beef suet, bacon fat, cream, butter, and olive and other vegetable oils all are used. There is little difference in expense between the

best olive oil and thick cream. The oil keeps better, and hence always may be available. A taste for salad oils is desirable and should be acquired. (Reference No. 42.) Better results often are obtained by combining cream with vegetables than by using butter and milk costing quite as much.

Whenever a vegetable dish, other than beans, etc., is to be the principal part of a meal, it is easily possible, as well as reasonable, to increase its food value by the addition of milk, cheese, or eggs. Skim milk may be heated uncovered until considerable water has evaporated, then little or no thickening is needed. (Reference No. 74, pp. 42-54, 60-62.)

For cereals, rice, etc., which are used as vegetables, see Reference No. 34, pages 34-37.

Although almost any vegetable may appear as soup or purée, scalloped, in salad, or as the basis of croquettes, fritters, or soufflés, the simplest way of preparing each is usually the best to develop its natural advantages, and a fair sample of any vegetable is not improved by overmanipulation or additions that disguise its own flavor. Intricate dishes have their place for emergency or variety. If our supply of any given vegetable is limited, combinations with other materials are in order. When we have an abundance of one kind, and it must be our main dependence for weeks, the form of serving it must be varied or we grow tired of it.

Just as one kind of starch may be used in place of another, or as the flavor of different varieties of the same family of plants is similar, so the pulp and fiber of different plants may be used interchangeably. The same general formula will apply to all "cream" vegetable soups, and without searching for new recipes we may venture to combine two or more vegetables, as beans and squash or potato and turnip, in the same soup.

COMBINATIONS OF VEGETABLES.

There are many combinations of vegetables which have proved satisfactory, and no one need hesitate to experiment with others. In general it is safe to combine a starchy vegetable with a succulent one, or one lacking in flavor with another that will give relish.

Cooked celery is agreeable with creamed potato. It may be added to Brussels sprouts or cabbage.

Contrasts in color often add to the value of a compound by making it attractive to the eye, as in carrots and green peas. Since some combinations of color are not considered pleasing, on this basis it is well to beware of serving tomato and red beets together, etc.

Green corn with potatoes and onion, with the addition of milk, etc., makes as good a chowder as fish in the opinion of many.

[Vegetable Foods, Bul. 245.]

Potatoes boiled and cut in slices or cubes may be used to extend expensive, highly flavored vegetables in salads, etc.

Potatoes with onions or white turnips make a more agreeable soup for some palates than the stronger vegetables alone.

Carrots often are more palatable cut in dice and blended with green peas than served alone.

Large white beans may be served in a tomato sauce with onion and green or red sweet peppers or both.

Mint, parsley, sweet peppers, onions, etc., may be added in small portion to many vegetables to give a new flavor when the usual methods of serving have become monotonous.

UTENSILS USED IN COOKING VEGETABLES.

The following suggestions as to utensils may be of practical use: A small scrubbing brush is essential for washing all vegetables that have grown in the earth, and should be kept in a convenient place, and for this purpose only.

Knives of different types are desirable. A small, sharp point is needed for the removal of eyes from potatoes and small blemishes from any vegetables.

Fancy cutters are not essential, but convenient, especially when it is necessary to give variety to a monotonous diet.

A wire basket is convenient to hold greens, string beans, or even potatoes while cooking, as thus they are less likely to adhere to the bottom of the kettle, and often it is easier to remove the basket than to drain off the water.

Colanders, purée strainers, potato ricers, etc., all are helpful in washing and straining potatoes, squash, etc.

A potato masher of strong, continuous wire, the two ends inserted in a wooden handle, is inexpensive and fully as satisfactory as a more costly style. (Reference No. 68, p. 724.)

COOKING TERMS.

A few of the terms indicating the use of vegetables may be of service in studying books arranged by chefs and others.

À la—according to, or in the style of.

Au gratin—with browned crumbs, as of bread, sometimes with cheese.

Bouquet of herbs—a sprig each of several kinds, as marjoram, parsley, savory, thyme.

Creole or West Indian—with tomatoes, often also peppers, onions, and mushrooms.

Jardinière—mixed vegetables.

Macedoine—a medley or mixture of vegetables, often with meat.

Maigre—without meat, as vegetable soup.

Printanière—a garnish of spring vegetables.

Purée—material mashed through a strainer.

Roux—flour browned in butter.

Soufflé—a puff, something inflated or swollen, as by beaten white of egg.

TIME OF COOKING.

While overdone vegetables are not desirable, underdone ones are often even less appetizing, therefore it is wise to start in season and stop the process as soon as the plant is tender, and then reheat quickly just before serving. Most time-tables in cookbooks do not take into consideration the variations in time required for the same kind of vegetables at different ages.

WAYS OF SERVING.

Soups.

This is one of the best ways to use left-over vegetables. A cupful of cooked cauliflower with some of the water in which it was cooked and equal amount of milk and a slight thickening of butter and flour will provide a cream of cauliflower soup. If the vegetable already has white sauce with it, reduce it with milk to right consistency, season and strain, and the soup is ready. (Reference No. 73, pp. 76-82.)

A purée is half way between a cream soup and mashed vegetables; it is sometimes a thick soup, but oftener strained vegetables made soft with milk or stock and butter, and served with meats. (Reference Nos. 18, pp. 25, 33; 70, p. 300; 75, p. 141; 98, p. 94.)

Salads.

The derivation of the word—something to be eaten with salt—shows its original simplicity. (Reference 71.) The young tips or tender leaves of certain plants are especially suited to this purpose. (See p. 21.)

Scallops.

These consist of cooked vegetables with cream sauce, seasoned, covered with buttered crumbs and browned in the oven. The proportion and thickness of sauce varies with the dryness of the vegetable, usually half as much sauce as vegetable, in the case of cabbage or onions.

Fritters.

Many vegetables, partially cooked, may be dipped in batter and fried in deep fat, thus giving variety and adding material of a different type from their constituents. (See Reference Nos. 69, pp. 106, 107; 70, pp. 348-357.) Among the vegetables best adapted to this process are cauliflower, celery, corn, okra, and salsify.

Croquettes.

These may be made from mashed vegetables held together with a small proportion of beaten egg or from chopped, cooked vegetables combined with a thick cream sauce. There is justification for the additional time required for this process when left overs can be thus used economically or when variety is needed.

Frying.

Parsley, "the crown of cookery," may be drained on towel, shaken to remove moisture, and fried 40 seconds in deep fat. (Reference No. 34, pp. 68, 73.)

From the potato cake or croquette it is but a short step to a potato crust for a meat pie (Reference No. 88, p. 46), or from the corn fritter to the tortilla and thus to doughs. (Reference No. 91, pp. 248-250.)

EXPERIMENTS AND PRACTICE WORK, ELEVENTH LECTURE.

Material needed.—Take vegetables not previously used in the practice lessons and prepare them in any of the standard forms.

Use any formula proved successful for some vegetable, and substitute another vegetable with due variation in other ingredients to adapt the formula to the composition of the substitute. For example, a cream soup may be made with any cooked and strained vegetable pulp, but if in one case it is potato with much starch and little flavor, little thickening and more seasoning will be needed; while another time, with celery or onion, more thickening and less added flavor will be required.

Exercise.—Make two green pea soups, using for one the dry split green peas at about 14 cents per quart, and for the other canned green peas at the same price per can. Count cost of materials, time, and fuel in each case.

For variations on these foundations, see Reference No. 78.

Verify and compare tables of weights and measures. (Reference No. 34, p. 33.) See also Reference No. 70, pp. 28, 54.

REVIEW QUESTIONS, ELEVENTH LECTURE.

1. Briefly describe the principal processes of cooking vegetables.
2. What general preparation would be common to all methods?
3. When may it be advisable to cook a double portion of any vegetable?
4. How shall we decide what materials to add to a vegetable in its preparation for the table?
5. What types of knives are most helpful in preparing vegetables? Describe different processes requiring different motions.
6. Some vegetables should be scraped, others pared. Give examples.
7. Describe several utensils helpful in preparation of vegetables.
8. Suggest combinations of vegetables and explain why they are acceptable.
9. Give general plan for making soups from one kind of vegetable. Mention combinations that might be used in the same way.
10. Describe process of making croquettes or some scalloped vegetable.

COURSE IN VEGETABLE FOODS.

TWELFTH LECTURE—DRYING, EVAPORATING, AND SALTING VEGETABLES.

Most foods are best when fresh, but since they can not always be had in this condition, some means must be found for preserving them. Decay in fruit or vegetables with its accompanying changes of texture and flavor is caused by the development of bacteria, molds, and other low forms of life. The various methods of preserving are simply means of checking the growth of these microorganisms. The first step should be to protect the material from unnecessary contamination from them, but since they are everywhere present in the air, even the most scrupulous cleanliness is hardly sufficient alone.

Most of the microorganisms grow only in the presence of moisture, and this fact explains the method of preserving by means of drying. (Reference No. 59, pp. 141-148.)

DRYING AND EVAPORATING FOODS.

The drying of foods has been practiced by primitive people from the beginning of civilization and is only aiding nature's processes. The seeds dry as they ripen and berries dry on the bushes. The Indians preserved blueberries and other fruits in this way. Pumpkin was often dried in strips by our colonial grandmothers, and sections of apple were strung and hung where they would dry readily. The bulk and weight of such foods is much less than in their natural condition, hence less room is required for storage and much less labor is involved in their transportation from place to place.

Herbs and spices were gathered, dried, and used to aid in the preservation of other foods. There was a right time for gathering each plant, it was believed, and in this lore ancient housekeepers were far more interested than modern ones.

Dried lavender, sweet grass, clover, and rose petals have from time immemorial been used by housewives to give perfume in their linen chests.

Dates, figs, and raisins long have been considered important foods for the traveler and explorer, containing valuable food material in concentrated and convenient form.

Modern evaporated fruits and vegetables differ from dried, simply in that the process is shortened, and there is less opportunity for fermentation, darkening, or the accumulation of dirt. (Reference No. 59, pp. 141-148.)

Tomatoes may be cooked, strained, and evaporated to a thick paste, resembling beef extracts in texture. In this form they are found in Italian markets.

Dried mushrooms are another commodity found in the foreign shops, which we might well learn to use.

Dried fruits and vegetables are less expensive than canned, mainly because they have required less labor in preparation and transportation than the canned. (Reference No. 52.) Their value is not generally appreciated, partly because they are cheaper and partly because the older dried products were often damaged by dust and insects, and because sufficient attention is not given to freshening them. Some good modern methods of drying and marketing are perfectly sanitary, and so far as chemists are able to tell us, a dried plum, peach, or vegetable, properly soaked and cooked, is just as valuable a food as a fresh one similarly cooked.

A homemade drier is a desirable appliance for the possessor of a good vegetable garden. A simple form consists of trays in a holder; four strong, upright, wooden supports, connected by horizontal bars, will hold several trays at once. The trays are made like window-screen frames and may be covered with wire netting for some things, but cheesecloth is preferable. The supports should be tipped at the base with a large nail or piece of metal that they may safely rest on the back of the stove when sunlight is not available. Shelled beans and green peas may be dried in this fashion. Some find it an advantage to scald them in boiling water before drying. Sweet corn should be slightly cooked, cut from the cob, and spread in very thin layers on the cheesecloth. Corn on the cob may be dried after scalding.

Small quantities of vegetables may be evaporated on earthen plates set over a kettle of boiling water or in an afternoon oven. While drying, they may hang in cheesecloth bags at the top of a warm closet. When very thoroughly dried, put away in tin boxes or glass jars.

PRESERVING BY SALTING.

The addition of salt indicates a step forward in the art of preserving food. The salt of the sea and the smoke of the camp fire were ready at hand for the first man intelligent or observant enough to make use of them.

Salt hastens the drying process by drawing out water from the vegetable tissues, making them firmer; it is also injurious to bacterial life. Young cucumbers and other green vegetables often are packed in salt as they are gathered and then kept until a convenient time comes for their further preparation for pickles. Greens, string beans, and similar vegetables used to be packed in salt like young cucumbers. Thoroughly freshened in the winter, they afford an agreeable variety. Now canned vegetables are more convenient.

Smoking is very commonly combined with drying and salting as a means of preserving foods, but almost exclusively with meats and fish. Dried smoked pears and other fruits are, however, not uncommon in some parts of Germany.

Sauerkraut, a German preparation of cabbage, is evidently the survival of an ancient way of preserving the vegetable. The process is somewhat akin to the ensiling of forage for animals. (Reference Nos. 59, p. 166; 103, pp. 213-216.) Firm cabbages are sliced and packed in salt, sometimes a few cloves, etc., are added, the mass is pressed down solidly under a weighted cover. After a time a partial fermentation takes place, the liquid is poured off and more salt and water added. The acid developed by the fermentation works upon the tough fibers, making them more tender. The sauerkraut is kept in a cool place and cooked as needed, like fresh cabbage. Dill pickles are made with cucumbers packed in a similar way, the cucumbers being flavored with dill. From similar methods our other types of pickles may have been evolved.

EXPERIMENTS AND PRACTICE WORK, TWELFTH LECTURE.

Drying Vegetable Substances.

Materials needed.—Frames covered with cheesecloth or white mosquito netting; these may be sections of boxes, even of heavy pasteboard.

Exercises.—The essentials in drying vegetables are cleanliness, heat, and circulation of air. The more rapid the process the less the danger of bacteria, ferments, and molds.

(1) Arrange part of the vegetables on the frame and expose in current of air, or place part in a very moderate oven with the door open, or in upper portion of an uncovered double boiler, and compare the results.

(2) Place pieces of different thickness side by side and dry under the same conditions. Cut a carrot in fancy shapes and dry for soup garnish.

(3) If possible, try (a) green or undeveloped tissues, (b) fully grown or ripe and overripe; compare results.

(4) Weigh and measure vegetables or fruits as purchased; weigh and measure after process of evaporation is completed.

(5) Dry parsley; note effect of too much heat in change of color. When dry, rub through strainer and use like fresh chopped parsley. Plunge in boiling water before drying and compare result with other not so treated.

(6) Try experiments with thick sections or with thin ones placed over each other, exposed to dust where process must be slow, without sun or heat, and note results. (Reference No. 71.)

(7) Test effect of alcohol, oil, vinegar, sugar, salt, and spice separately, and two or three together on similar sections of the same fruit or vegetable, raw and cooked.

(8) Test effect on similar sections from the same article, thus: (a) In refrigerator; (b) in sunlight; (c) in moderate oven; (d) in dusty room.

Restoring Dried Foods to their Original Conditions.

Reverse the experiments just described by the use of dry vegetables and fruits, such as evaporated apples, beans, cherries, peas, peaches, prunes, sweet

[Vegetable Foods, Bul. 245.]

corn, and the dry Julienne (mixed vegetables) which comes prepared for soups. Weigh and measure these as purchased; weigh and measure after soaking. Make tea, unroll the leaves and note shape; make teas from herbs.

Nuts are a type of dry or condensed foods which may be studied in this connection.

Exercise.—Take 1 pound of mixed nuts in shells, or $\frac{1}{4}$ pound each of any available kinds. Weigh before and after shelling. Note composition of each type. (Reference Nos. 26; 30.) Suggest additions and combinations with other food materials to dilute the nuts and make a food which in composition might be similar to a meat and potato hash or legumes stewed with pork. (Reference No. 75, pp. 16, 18, 32, 33, 41, 42.)

REVIEW QUESTIONS, TWELFTH LECTURE.

1. What objects are sought in the preservation of vegetables?
2. Describe methods used before the process of canning was discovered.
3. Explain the effect of air and sunlight on canned foods.
4. Mention appliances helpful in any processes of preservation of vegetables.
5. Explain the action of salt, sugar, spice, oil, vinegar, alcohol on vegetable tissues.
6. Contrast processes of drying and canning, giving the relative merits of each.
7. How is the large percentage of water in vegetables shown in any method of preservation?
8. What is the relative proportion of nut meats to shell, both as to bulk and weight?
9. Mention points for and against buying shelled nuts or seeded raisins, etc.
10. Estimating cost of jars, fuel, etc., allowing a fair price for your own labor, what does it cost you per jar to can your own fruits and vegetables? How does this compare with drying?

[Vegetable Foods, Bul. 245.]

COURSE IN VEGETABLE FOODS.

THIRTEENTH LECTURE—PRESERVING AND CANNING VEGETABLES.

The home canning of fruits and vegetables is a matter of more importance to those who grow such products than to those who must buy them in any case. The cost of labor and fuel, added to the cost of the raw material, makes it wiser for many to buy the canned article. But there is no question that the surplus products of the home garden should be preserved in some form for future use. The publications cited in Reference Nos. 11 and 27 treat different phases of this subject fully and can be used as textbooks for this lesson. See also Reference No. 9.

The essential points in all canning are few—absolute cleanliness and sterilization and suitable containers, which means the destruction and exclusion of ferments, molds, and bacteria. (Reference Nos. 59, Ch. XII; 72, pp. 284–288; 74, pp. 34–38.)

Poisonous or doubtful preservatives never should be used. Long use has so accustomed us to the use of sugar, salt, vinegar, and spices that we forget that flavor is secondary to their preservative effect. (Reference Nos. 27, p. 8; 59, pp. 157–162.)

A practical point worth remembering is that 1 quart by measure means 1 pound in weight with many of the green vegetables and fruits. For serving or canning it is well to remember also that 1 quart of average substances as purchased will be required to fill a pint jar or dish, the shrinkage being due to loose measure, removal of uneatable portions, and condensation in cooking.

PRESERVING WITH SUGAR.

The earliest method of preserving fruit aside from drying appears to have been to coat it with honey and allow it to dry somewhat. From that may have been derived the plan of packing in jars and filling the spaces with strained honey. This might have been the result of observation of the way in which flowers, etc., accidentally coated with honey retained their original freshness. In any case it was unconscious application of the fact that bacteria and molds do not grow readily in the presence of concentrated sugar solutions. (Reference Nos. 59, pp. 162–165; 100.)

Preserving with sugar is, of course, more important for fruits than for vegetables, but is worth consideration here, partly because it

shows an important principle in the general science of food preservation, and partly because a few vegetables are sometimes put up in sugar.

Dates, figs, grapes, and other fruits rich in sugar have always been known to keep well when only partially dried, and others less sweet have been dried with the addition of a little sugar. The old-fashioned New England custom of drying wild raspberries with maple sugar is an illustration of the latter, and also of how necessity sometimes leads to the discovery of pleasant flavor combinations.

Although sugar is a good preservative against bacteria and molds, it is not so efficient against the yeasts which cause fermentation; hence the occasional "spoiling" of even fairly sweet fruit preserves and the need of keeping them in clean, tight jars.

If the products commonly classed as vegetables were preserved in sugar, their sweetness would spoil them for their ordinary uses in the bill of fare. Where fruits are scarce and expensive women have been ingenious in the use of vegetables in place of them. Thus the seed vessels of roses are sometimes made into preserves in northern Europe. Pumpkin, squash, carrot, even beet and cabbage are used in this way and flavored with lemon, ginger, etc. Certain kinds of tomatoes, also, such as the yellow plum variety, are frequently preserved in sugar, but they are so sweet in this form that they are used as a dessert rather than in the meat or salad course. Small quantities of sugar are sometimes used in canning such vegetables as green corn and peas.

Since sugar and other sweetening materials are of vegetable origin, they may be briefly mentioned here. (Reference Nos. 4, 6, 15, 104.) Honey already has been considered among the flowers (see p. 50). Maple sirup and sugar making were known to the Indians, who recognized a "sugar-making moon" in the spring. A study of the history of methods of condensing the sirup, from the primitive appliances of a century ago to the improved evaporation of the present, would be of interest and suggest possible advance in household methods of cookery.

Cane sugar is a popular and valuable food, and its use appears to be increasing everywhere. But there are limits to human capacity, and some physiologists believe that its consumption should not much exceed 1 pound per person per week. (Reference No. 4, p. 27.)

Granulated and other white sugars are the most important products of sugar cane, but brown sugars and molasses also play a useful part, not only in those sections of the Southern States where molasses is a large factor of the diet, but also in general cooking. The old-fashioned somewhat acid molasses was the result of evaporation in open kettles, a process rarely followed now.

During the last half century there has been a marked increase in the production of sugar from special varieties of beets. So far as the chemist can discern, this sugar is identical with that made from sugar cane.

Regarding corn sirups, glucose, etc., see Reference Nos. 4, page 9; 23, pages 14, 15.

Sorghum sirup is less used since corn sirups have been manufactured.

The evaporation of water in which sweet vegetables like carrots, green peas, or squash have been boiled would yield a sweet sirup.

PRESERVING BY STERILIZATION—CANNING.

In ordinary sweet preserves the heat of cooking may increase their keeping qualities by killing some or all of the microorganisms present in the raw material. It has been shown that such sterilization is one of the reasons for cooking vegetables (see p. 71). It is the most important factor in canning vegetables, whether in the home or in the factory. (Reference No. 59, pp. 169–181.)

Prolonged or extreme heating tends to change the flavor and texture of foods, sometimes for the worse. The best method of canning, therefore, will be the one which kills the most of the undesirable microorganisms while it occasions the least injury to the material. Whatever method is used, the receptacles in which the food is put must be sterilized as carefully as the food and finally closed so tightly that no fresh organisms can find entrance.

The method known as intermittent or fractional sterilization usually answers all these conditions. Its success seems to depend on two facts, first, that more heat is required to kill some of the spores of the microorganisms than the organisms themselves, and second, that these spores become full-fledged organisms within a short period (say 24 hours) after they have been subjected to heat sufficient to kill the parent organisms. When this method is followed the vegetables are put in jars; the rubber rings and glass covers are laid on but not clamped; sterilized water is added, and the jars heated to the boiling point of water for about an hour; then the jar is fastened. This process is repeated with clasps up 24 hours later, and again the third day. (Reference Nos. 27, pp. 7, 15, 16, 19; 58.)

For a continuous process a longer time is required. String beans, etc., should steam 3 to 5 hours in the jars and be tested before being put away. To test them, unclamp the jar and lift by the cover; if the contents are not satisfactorily sterilized, the cover will come off.

Where the source of the vegetables is uncertain it is a safeguard to blanch or parboil them in well-salted water and drain thoroughly before packing them in the jars for either the fractional or the continuous process. A small quantity of cooking soda may be added

to the water in which string beans are parboiled and which is not used in the canning process. As vegetables are salted before serving, from 1 teaspoon to 1 tablespoon of salt is frequently added to each jar.

The relative economy of the use of fresh vegetables and canned ones involves many problems, including convenience, value of time and labor, as well as variety and quality of the foods.

Compare canned green peas with fresh ones in the pods out of season and the advantage is with those from the can as to quality as well as cost. But canned or fresh at the lowest rates for either are expensive compared with the amount of nutriment obtainable for the same money from the dry green or split yellow peas.

To illustrate this matter in detail: A 15-cent (pint) can of Lima beans yielded 150 beans. The same number of dry beans at 9 cents per pound weighed $5\frac{1}{2}$ ounces, or one-third of a pound, and measured less than 1 cup. The dry beans would cost 3 or 4 cents; with a fair allowance for labor and fuel the total cost would be less than half that of the canned beans and the quality much better.

The larger the family the greater the gain in the use of the dried beans, for even at wholesale rates the cost of the cans would be greater than that of dry beans plus the labor and fuel required for the preparation of the latter.

Because this happens in one instance it does not follow that it will in others. Some of these questions, as that of canned beets versus fresh, etc., may be worked out in the practice period. In general it will prove that the fresh vegetable directly from the garden in its season is always superior to the canned, and that a dried fruit or vegetable properly soaked and cooked will rival all but the very highest grades of canned foods of the same kind.

"Canned vegetables are relatively free from adulterations by means of foreign substances. The different grades of products may with care be readily detected by the general appearance of the sample." (Reference No. 43, p. 48.)

To use canned vegetables, open an hour or more before using; empty the can as soon as opened and expose the contents to the air to freshen. To freshen quickly, drain the vegetables and rinse with cold water. Taste of the liquor in the can and use or discard as seems best; do not keep it long after opening.

EXPERIMENT AND PRACTICE WORK, THIRTEENTH LECTURE.

Action of Bacteria, Molds, etc.

(Reference No. 71, experiments 41, 42.)

Exercises.—Expose bread, cheese, fruit juices, cut raw and cooked vegetables, milk, etc., to dusty air, and leave for some time; note changes in each. Note the cloudy appearance of fruit sirup, indicating presence of bacteria. Scald the fruit, remove scum, and sirup will be seen to be clear again.

Leave stewed fruit in glass jar uncovered. Note the difference in lower portions which do not come in contact with air. After a time, stir slightly so that part of top layer is distributed throughout the jar. Note the groups of bacteria, etc., forming where portions of the top layer remain.

Note the need of sterilization of jelly bags, jars, utensils, and the danger from sweeping, dust from open window, etc.

Sugar.

An entire lesson might be given to a study of sugar and the way it is affected by heat and moisture. (Reference No. 34, p. 69.)

Caramelization, etc.: Try experiments 41 and 42. (Reference No. 71, p. 48.)

With a sirup gauge, experiment with sirups of different densities. (Reference No. 11.)

Canning.

Materials needed.—Any vegetables available, including tomatoes, either fresh or canned; apple or green grape jelly, fresh mint, spinach extract for coloring (p. 20). Several types and sizes of jars.

Exercises.—(1) Can any available fresh vegetable. (Reference No. 11, p. 5.)

(2) When fresh tomatoes are not available, open a quart can, reheat and seal part in half-pint jar. This is a practical point for the small family where a larger can is too much to use at once. Another portion of the tomato may be strained and canned in a half-pint jar. The remainder, strained, may be evaporated to half its first bulk, seasoned with spices, salt, and vinegar, and put in bottles as catsup. Note whether varying the kind of spices and the proportion of vinegar affects the flavor materially. (Reference Nos. 11; 71, pp. 50, 51; 72, pp. 259-264.)

(3) Note results with different types of jars. Have different sorts of tops any special advantages? Why are good rubber rings essential?

Another lesson on this general subject might deal with the use of canned foods, as already indicated in Lecture 7 with the tomato (p. 53). Cream soups may be made from canned tomato, peas, asparagus, etc. Scalloped tomato and corn fritters are other dishes in which small quantities of canned vegetables may be utilized. For ways of avoiding waste in preparing vegetables for canning, etc., see Reference No. 27, page 15. This may suggest other possible combinations for soups, salads, etc., not already covered in other lessons.

Combinations of highly flavored fruits with others of different flavor, or sometimes of less distinctive taste, are by no means uncommon. Thus, housewives often combine raspberries and currants for jelly making or for canning. Another combination, which may prove useful if lessons are given at seasons when fresh berries and fruits can not readily be procured, is raisins, orange, and cranberry. The proportion is a matter of taste, so it is well for pupils to use different quantities and compare results.

In old domestic recipes, quinces are often combined with sweet apples which have little distinctive flavor or with pears of firm texture and also lacking in this quality. The relative proportions of the two fruits is a matter of preference, the greater the proportion of quinces, the higher the flavor.

Such preserves can be made by the student if time permits. Note the texture of the different fruits when cooked.

Experiment with vegetable pulp like sifted squash, pumpkin, sweet potato, or tomato as a basis for marmalade, with flavor supplied by spice or a small proportion of high-flavored fruit like apricot or quince.

REVIEW QUESTIONS, THIRTEENTH LECTURE.

1. What kind of kettles would you choose for canning, and why?
2. What is the aim of this plan of preservation?
3. Has any case in your own experience shown the importance of sterilization?
4. Describe fractional sterilization.
5. Give an outline of the process of canning based on your own experience.
6. How would you estimate shrinkage between market and jars, including imperfect vegetables, necessary refuse, effect of cooking, etc.?
7. What fruits and vegetables do you can at home?
8. What do you find it wiser to buy, and why?
9. Give details of relative cost to you of buying tomatoes to can yourself or buying them already canned.
10. Does this lesson explain any failures that have troubled you?

[Vegetable Foods, Bul. 245.]

COURSE IN VEGETABLE FOODS.

FOURTEENTH LECTURE—PICKLING VEGETABLES.

VINEGAR.

Vinegar is another substance which acts as a food preservative. Its name means "sour wine," and at least when a domestic product it is usually made from cider or light wine, in which bacteria give rise to fermentation and the production of acetic acid. (Reference No. 60, p. 275.) This acid gives the vinegar its sour taste, and is very unfavorable to the growth of bacteria. When vinegar is used in pickle making, the hard fibers of undeveloped vegetables, vegetable skins, etc., are softened by it. Spices and salt have much the same effect as vinegar on bacteria, though in a different degree. These preservatives, of course, entirely change the flavor of food in which they are used, and usually set it among the condimental materials. (Reference Nos. 39, p. 29; 59, pp. 165-168; 61, pp. 140-142; 63, pp. 60-62, 68-74; 71, p. 48; 74, p. 33; 85, chs. 16, 17.)

HERB VINEGARS.

Herb vinegars are useful for the housekeeper's store closet, as by their means a new flavor is easily added to a salad sauce. These may be prepared either in Lesson 10 or here by steeping fresh or dried herbs in cold or hot vinegar. The more delicate flavors may be lost by heating, but the cold process is slower.

PICKLES AND SAUCES.

The word "pickle" is applied to the process of preserving foods, either with salt or vinegar, or both. Thus, meats are pickled in brine, either a saturated solution of salt and water or the water which the dry salt draws out of the foods themselves, which are often three-quarters or more water. When the term is applied to vegetable foods, it is commonly understood to mean preservation with vinegar, either with or without the addition of other materials, as salt, spices, or sugar. In some cases as in dill pickle making, the acid is supplied by the fermentation of the product itself and not by adding vinegar. The number and variety of fruits and vegetables used in pickle making is almost endless, cucumbers, tomatoes, onions, and green or unripe fruits being most common.

An old household name for pickles in which the flavor of vinegar predominates is "sour pickles." Those in which spices are particularly noticeable are frequently spoken of as "spiced pickles" or "spiced fruits," and those in which sugar predominates as "sweet pickles."

The transition is gradual from the acid fruits preserved with sugar and spice to the sweet pickles where somewhat tasteless vegetable tissue has been filled with vinegar instead of natural fruit acid and spiced and sweetened.

By using them for pickle making our thrifty foremothers contrived to make attractive most unpromising food materials as well as common fruits, etc., for instance, the rinds of the watermelon, the unripe windfalls from the fruit tree, martynias, cucumbers, ripe tomatoes, and the green tomatoes remaining when frost had killed the vines. Even young ears of corn 2 or 3 inches long are used for pickles. Though the kernels have already formed, the cobs are tender and will absorb the vinegar.

Some materials are more satisfactory for pickle making if first soaked in salt water to extract acrid flavors. Special treatment of this sort is required with such materials as green melons, but with the more common fruits and vegetables used in pickle making there seems to be little difference in results, whether they are soaked overnight in that fashion or whether they are parboiled in salt water. By either process some water is extracted from the tissues, which are then ready to fill out with the prepared vinegar.

Old recipes for pickle making sometimes call for ingredients not now recommended. The use of alum to insure crispness or a brass kettle to "green" the pickles can not be advised. In these days when fresh fruit from all over the world comes to our doors, are we justified in spending much time to provide many jars of highly seasoned condiments for ourselves or our neighbors? This is a question the housewife should consider.

When the materials used in pickle making are so finely divided that the resulting product is a more or less thick fluid, they are usually called "catsups" or "sauces."

Tomato is a favorite foundation, but many fruits may be cooked and strained for this purpose; decayed ones never should be used.

There are hosts of table sauces which, by their names, seem to be derived from the Orient. Consult a dictionary for the origin of some of these words: Catsup or ketchup, chili sauce, chowchow, chutney, etc., which are made in many ways from diverse materials.

CARE OF PICKLED AND CANNED GOODS.

Any canned foods or pickles should be well cared for. The stone jars with more or less tightly fitting covers used by our grandmothers

[Vegetable Foods, Bul. 245.]

may serve for very sweet or for highly seasoned material, but the glass or other jars with air-tight covers are more satisfactory for all purposes. Each household should have several sizes. Often a large jar is opened and not half its contents used. The remainder can be reheated and again canned in a smaller jar. All jars should be carefully labeled. When one lot of pickles has been used, the vinegar still may serve for partial preparation of another vegetable. The spiced sweet pickle vinegar is usable in several other ways; prunes or beets may be put into it or it may be used in mince pies or stiffened with gelatin to serve with meats.

EXPERIMENT AND PRACTICE WORK, FOURTEENTH LECTURE.

Materials needed.—The materials for this lesson will depend on season and locality. Cabbage and onions usually will be available if nothing else is at hand. Citron melon, watermelon rinds, and green tomatoes are excellent for such lessons.

Simple Pickles.

A simple type of pickling may be observed by grating horseradish or putting it through the food grinder and combining it with sufficient vinegar to moisten it.

Beets cooked in Lecture 8 (p. 47) might be kept in vinegar until this lesson. If the jars were not entirely closed, mold may have formed on the top and yet the beets below be in good condition. They now might be put in a spiced sweetened vinegar, scalded to sterilize them, and canned.

Combination in Pickling.

Almost any combination of onions, peppers, and tomatoes, ripe or green, will form an acceptable relish with vinegar and spices. The basis of the pickles may be of one kind or several, but in the latter case each should be parboiled separately, or some may be hard while others are overcooked.

Exercise.—Collect personal and family recipes for all types of pickles and refer to standard cookbooks dealing with the subject. With the aid of the blackboard, reduce these formulas to their lowest terms and arrange in tabular form.

It will surprise the pupils to see how many recipes for sweet pickles may be condensed to some such form as this: For 2 pounds of prepared vegetables or fruit, 1 pound of sugar (or less), one-half pint vinegar, 1 ounce mixed spice.

The usual sauce for mustard pickles is some variation of this formula: Mix one-fourth to one-half cup sugar with 1 ounce ground mustard and 2 tablespoonfuls flour. Stir into 1 pint hot vinegar and cook until thickened. Turmeric may be added to give color. Combine with 1 quart mixed vegetables parboiled. Note resemblance between salads with cooked dressing and mustard pickles.

Salad oil, such as olive oil, cottonseed oil, or peanut oil, in small proportion is often added to mixed pickles or poured over the top after they are put in jars to protect them from the air and prevent the growth of molds.

To show that the natural acid of some fruits may have the same antiseptic effect as vinegar, put cranberries or rhubarb in sterile jars; fill the jars with clear, freshly sterilized water and seal; time will show that the fruit keeps as well this way as if cooked.

REVIEW QUESTIONS, FOURTEENTH LECTURE.

1. Define pickles.
2. What are the essential steps in the process of pickling?
3. Describe the making of sweet pickles.
4. Mention some names of products of this type which indicate a universal demand for such foods.
5. Is there any reason why pickles and relishes should be less important to us than to our grandmothers?
6. Why is vinegar useful as a preservative?
7. Are any fruits or vegetables ever pickled without vinegar?
8. What may be combined with vinegar to give it greater efficiency?
9. What need of caution in selecting utensils for pickle making.
10. Are exact recipes essential in the preparation of pickles?

[Vegetable Foods, Bul. 245.]

COURSE IN VEGETABLE FOODS.

FIFTEENTH LECTURE—VEGETABLES FOR THE TABLE: MARKETING.

Savages found their food where they could and pursued game from place to place. Nomadic tribes required a large area to sustain a small population. The fixed hearthstone and planting of seeds were higher steps on the ladder of civilization; grazing succeeded the chase as a method of supplying food, and grazing and crop raising combined are the foundations of agriculture. We do not yet know the possibilities of intensive farming in the development of the food supply. Moreover, the skilled efforts of the farmer must be supplemented by equal intelligence on the part of the cook who handles his products.

CULTIVATING VEGETABLES FOR THE TABLE.

There is an increasing attention given to the cultivation of vegetable foods, with the result that the quality is better and the texture less fibrous. Less attention evidently is being given in this country to production of cakes and pastries, and the per capita consumption of flour appears to be diminishing as coarser cereals, fruits, and vegetables are used more. Some time ago the editor of a hotel periodical gave a summary of many holiday menu cards to show that vegetable dishes were not given the attention or prominence they deserved; that chefs were inclined to ignore common and inexpensive foods; and that if care were taken to make such foods attractive the hotel and restaurant patrons would be educated to prefer them to the superfluity of meat dishes usually provided.

“The result of this, in these days of high prices for all foods, is that the cost of the meals as a whole would be lessened. * * * It is these dishes that are wanted to give variety to the bills of fare and do away with that ‘sameness’ in hotel cuisine noticeable throughout this most prolific land.” This is quite as true of the home table.

Farmers are beginning to see more profit in the intensive cultivation of choice vegetables than in larger acreage of less profitable crops. Too often a type of plant is chosen for its shipping or keeping qualities rather than for flavor and texture. The improved quality of fruits and vegetables gained by improved methods in agriculture is often more than offset by carelessness in packing. Good varieties should be grown by the best methods and handled and shipped so that they reach the consumer in satisfactory condition.

What is needed is greater knowledge on the part of the producer of the relative values of different varieties of the same plant, while the consumers must be discriminating in the selection of the special article for a given purpose or know in what way the available material can best be utilized.

The housekeeper unfamiliar with the country garden hardly knows when a vegetable is at its best, and may buy them at abnormal prices out of season and rely on canned vegetables when "natives" are abundant. Easy transportation, cold storage, and cultivation under glass have changed the times and seasons to a great extent, and while this is often an advantage, still we do not have the same desire or appetite for foods attainable at any time as we do when their season is short. Producer and consumer should confer frequently to secure better food for all and better methods for its transportation and use.

Cold storage has advantages, but often is carried so far that there is distinct loss of quality or flavor or both. (Reference No. 28, p. 27.)

WEIGHTS AND MEASURES.

There is need everywhere of enforcing definite standards of measure and weight, especially in cities where the average portion sold is small; the arithmetic of the vegetable markets is confusing, and more uniform methods of measuring market produce should be adopted. For example, sometimes onions are sold by the quart, sometimes by the pound or by the bunch. Four or six or more may constitute a bunch of beets or young turnips, etc., with little regard to the size of the individual roots.

In many States a legal weight to the bushel has been established for the standard common vegetables; thus a bushel of potatoes should weigh 60 pounds; white beans, 60 pounds; carrots and parsnips, 50 pounds; turnips, 55 pounds; onions, 57 pounds, or about 2 pounds to the quart.

TRADE CUSTOMS AND MARKET CONDITIONS.

Certain trade customs tend to foster ignorance of the best season for each vegetable and the best way to use it. A premium has been placed on bulk rather than quality, size rather than flavor. Why should not summer squashes and cucumbers be sold by weight as well as winter squashes? Most of those in the markets now are overgrown. Asparagus 8 or 10 inches long is less desirable than if it had been cut a day earlier at half the length. The custom of keeping asparagus fresh in water increases its weight by absorption of water, but causes loss of nitrogenous and mineral matter. Celery should not have its roots spoiled by nails or its stalks bound with colored strings. (Reference No. 94, pp. 15, 16.)

The medicinal qualities of vegetables need fuller investigation. Money spent for scientific research in establishing or refuting traditional and popular ideas about the effects of celery in rheumatism, onions for sleeplessness, etc., should give good returns. Probably in most cases green vegetables and salad plants would prove more useful than "spring medicine," in which so many have faith.

There are times when it is justifiable to pay a larger price for a food than its actual nutritive value seems to warrant because its attractive appearance and flavor will make palatable the more familiar and less costly foods.

The wise buyer knows the nature of each article so well that when strict economy is practiced decayed vegetables are discarded, while those only slightly withered but so unattractive as to be low priced are secured and promptly freshened. (Reference No. 75, p. 281.)

The prices of vegetables in city markets seem exorbitant to those who have never had to pay cash for such products, and then only is the home garden fully appreciated. (Reference Nos. 18; 45, pp. 201, 202.) Too often in the country the garden is neglected that "money crops" may have more attention because its economic value is not recognized. A garden plat intelligently arranged and its products properly prepared for the table, often yields more profit than any corresponding area on a farm.

At the present time the list of vegetables which may be grown is a long one and is being added to as new plants are found or new varieties produced. Some of the novel plants recently brought to this country for experiment by the Department of Agriculture are the "udo," a salad plant from Japan; Hungarian paprika; the dasheen; and the adsuki bean.

The future, judging from the recent past, will give increased facilities for the preservation and transportation of all types of vegetable products from every part of the world. Many plants now little known will be studied, improved, and made available. Fewer seeds and less cellulose or fiber will remain in many of the plants now in common use. There will very likely be greater concentration of the valuable constituents of such foods for convenience in transportation and preservation, but none of the improvements are likely to change the fact that the vegetables are at their best when the interval between their picking and their use is the shortest possible.

GROWING VEGETABLES FOR THE HOME TABLE.

Women should be encouraged to take more interest in the vegetable garden. Even the actual work there is less taxing than much that is done indoors, which gives less valuable return in health and comfort. (Reference No. 17.)

Too many gardens are planted all at once. It is far better to leave open spaces and plant additional rows of lettuce, radishes, beans, and corn each week until after the middle of summer. Another important point is to prevent the maturing of any seeds if it is desired that plants continue to produce. Therefore cucumbers, summer squash, etc., must be kept closely cut, even when not needed for the home table.

EXPERIMENT AND PRACTICE WORK, FIFTEENTH LECTURE.

Materials needed.—Pencils and paper.

Exercise.—Plan menus for single meals or longer periods containing a wide variety of vegetable products and supplement any deficiencies of nutritive value by other additions. (Reference No. 56.)

Review any processes needing further attention.

Take this opportunity to test initiative of pupils in the preparation of any novel vegetable products available at the time.

REVIEW QUESTIONS, FIFTEENTH LECTURE.

1. Tell all you can of the weights and measures commonly used for the sale of vegetables.
2. Are there any improvements that you can suggest in market customs?
3. How many varieties of vegetables are attainable in your vicinity from garden or market?
4. Are there any vegetables available which are not used in your household, and why?
5. What means have you employed to make any vegetable more popular on your family table?
6. Mention cases in your experience when vegetables were unpalatable because of careless methods of cooking.
7. What of the relative economy of animal and vegetable foods for your household?
8. Plan a menu for one week including as little meat as you think would be reasonable.
9. Compare the energy required to care for a home vegetable garden with that used in making cake, pies, and puddings.
10. What have you to say regarding the rational use of meats, vegetables, and desserts in planning wholesome meals?

[Vegetable Foods, Bul. 245.]

APPENDIX.

REFERENCES.

PUBLICATIONS OF THE UNITED STATES DEPARTMENT OF AGRICULTURE.

1. How to Grow Mushrooms. Farmers' Bul. 53.
2. Bee Keeping. Farmers' Bul. 59.
3. Mushrooms as Food. Farmers' Bul. 79.
4. Sugar as Food. Farmers' Bul. 93.
5. Beans, Peas, and Other Legumes as Food. Farmers' Bul. 121.
6. Sorghum Sirup Manufacture. Farmers' Bul. 135.
7. Principles of Nutrition and Nutritive Value of Food. Farmers' Bul. 142.
8. Cassava. Farmers' Bul. 167.
9. Home Manufacture and Use of Unfermented Grape Juice. Farmers' Bul. 175.
10. Dandelions in the Lawn. Farmers' Bul. 186.
11. Canned Fruits, Preserves, and Jellies. Farmers' Bul. 203.
12. The Cultivation of Mushrooms. Farmers' Bul. 204.
13. Okra: Its Culture and Uses. Farmers' Bul. 232.
14. Cereal Breakfast Foods. Farmers' Bul. 249.
15. Maple Sugar and Sirup. Farmers' Bul. 252.
16. Cucumbers. Farmers' Bul. 254.
17. The Home Vegetable Garden. Farmers' Bul. 255.
18. Preparation of Vegetables for the Table. Farmers' Bul. 256.
19. Methods of Canning. Farmers' Bul. 262.
20. Celery. Farmers' Bul. 282.
21. Use of Fruit as Food. Farmers' Bul. 293.
22. Potatoes and Other Root Crops as Food. Farmers' Bul. 295.
23. The Food Value of Corn and Corn Products. Farmers' Bul. 298.
24. Home-Grown Tea. Farmers' Bul. 301.
25. Sweet Potatoes. Farmers' Bul. 324.
26. Nuts and Their Uses as Food. Farmers' Bul. 332.
27. Canning Vegetables in the Home. Farmers' Bul. 359.
28. Care of Food in the Home. Farmers' Bul. 375.
29. Economical Use of Meat in the Home. Farmers' Bul. 391.
30. Chemical Composition of American Food Materials (Rev. Ed.). Office Expt. Stas. Bul. 28.
31. Food and Nutrition Investigations in New Jersey. Office Expt. Stas. Bul. 35.
32. Losses in Boiling Vegetables, etc. Office Expt. Stas. Bul. 43.
33. Iron in Food and its Functions in Nutrition. Office Expt. Stas. Bul. 185.
34. Course in Cereal Foods and Their Preparation. Office Expt. Stas. Bul. 200.
35. Digestibility of Starch as Affected by Cooking. Office Expt. Stas. Bul. 202.
36. Calcium, Magnesium, and Phosphorus in Food and Nutrition. Office Expt. Stas. Bul. 227.
37. Functions and Uses of Foods. Office Expt. Stas. Bul. Circ. 46. (rev.)
38. Relation of Nutrition Investigations to Questions of Home Management (Reprinted from Ann. Rpt. of O. E. S., 1907).
39. Farmers' Institutes. Office Expt. Stas. Bul. 178.
40. Cheese and Other Substitutes for Meat in the Diet (Reprinted from Yearbook, 1910).

41. The Honey Bee—A Manual of Instruction in Apiculture. In Div. Entomol. Bul. 1. (n. ser.)
42. Olive Oil and Its Substitutes. Bur. Chem. Bul. 77.
43. Some Forms of Food Adulteration. Bur. Chem. Bul. 100.
44. Three New Plant Introductions from Japan. Bur. Plant Indus. Bul. 42.
45. The Wastes of the Farm (Reprinted from Yearbook, 1908).
46. Observations on Recent Cases of Mushroom Poisoning in the District of Columbia. Div. Botany Circ. 13.
47. Horse-Radish. Div. Botany Circ. 15.
48. Yams in the West Indies. Div. Botany Circ. 21.
49. Burr or Globe Artichokes. Div. Botany Circ. 22.
50. Some Edible and Poisonous Fungi. Div. Veg. Path. Bul. 15.
51. Standards of Purity of Food Products. Office Sec. Circ. 10.

UNITED STATES NAVY DEPARTMENT.

52. Mem. Information of Officers. Pay Corps, etc., 85, April 1, 1908.

PUBLICATIONS OF THE AGRICULTURAL EXPERIMENT STATIONS.

53. Mushroom Growing for Amateurs. New York (Cornell) Experiment Station Bul. 227.
54. Buckwheat. New York (Cornell) Experiment Station Bul. 238.
55. Insect Pests of House and Garden. Cornell Reading-Course for Farmers' Wives, n. ser. 1. Bul. 2.
56. Human Nutrition. Cornell Reading-Course for Farmers' Wives, n. ser. 2. Bul. 6.
57. Composition of Mushrooms. Vermont Experiment Station Rpt. 1903
58. Canning Fruits and Vegetables. Preserving Fruit Juices. Oregon Experiment Station Bul. 87. Canning Mushrooms. Oregon Experiment Station Bul. 98.

BOOKS AND PAMPHLETS.

59. Bacteria, Yeasts, and Molds in the Home. H. W. Conn.
60. Food and the Principles of Dietetics. Robert Hutchison.
61. Food Materials and their Adulterations (Third Edition). Ellen H. Richards.
62. Chemistry of Cooking and Cleaning. Ellen H. Richards and S. Maria Elliott.
63. Household Bacteriology. S. Maria Elliott.
64. Food and Dietetics. Alice P. Norton.
65. Chemistry of the Household. Margaret E. Dodd.
66. The Book of Vegetables. Allen French.
67. Cyclopedias of American Agriculture. L. H. Bailey, Editor.
68. Encyclopedia of Practical Cookery. T. F. Garret, Editor.
69. Boston Cook Book. Mary J. Lincoln.
70. Boston Cooking School Cook Book. Fannie M. Farmer.
71. Selection and Preparation of Food. Isabel Bevier and Anna R. Van Meter.
72. Elements of the Theory and Practice of Cookery. Mary E. Williams and Katharine R. Fisher.
73. Home Science Cook-Book. Mary J. Lincoln and Anna Barrows.
74. Principles of Cookery. Anna Barrows.
75. Vegetable Cookery and Meat Substitutes. Sarah T. Rorer.
76. Practical Cooking and Serving. Janet M. Hill.
77. European and American Cookery. Gesine Lemcke.
78. How to Cook Vegetables. Olive Green.

79. Foundations of Botany. J. Y. Bergen.
 80. The Teaching Botanist. William F. Ganong.
 81. Botany. Charles E. Bessey.
 82. Chemistry—Briefer Course. Ira Remsen.
 83. Human Mechanism. T. Hough and W. T. Sedgwick.
 84. The Spirit of Cookery. J. L. W. Thudichum.
 85. Introduction to General Biology. W. T. Sedgwick and E. B. Wilson.
 86. Food and Its Functions. James Knight.
 87. The Pleasures of the Table. G. H. Elwanger.
 88. Practical, Sanitary, and Economic Cookery. Mary H. Abel.
 89. The Fireless Cook Book. Margaret J. Mitchell.
 90. Woman's Share in Primitive Culture. O. T. Mason.
 91. Home Economics. Maria Parloa.
 92. Fuels of the Household. Marian White.
 93. Salads and Sauces. Thomas J. Murrey.
 94. Art of Cookery. Emma P. Ewing.
 95. Mushrooms and Their Use. Charles H. Peck.
 96. Chemistry of Plant and Animal Life. H. Snyder.
 97. Human Foods and Their Nutritive Value. H. Snyder.
 98. French Home Cooking. Berthe J. Low.
 99. Outlines of Lessons in Botany. Newell.
 100. Our Viands. Buckland.
 101. The Chocolate Plant. W. Baker & Co.
 102. Spices and How to Know Them. W. M. Gibbs.
 103. Chemistry of Cookery. W. M. Williams.
 104. Encyclopedia Americana.

LIST OF APPARATUS AND SUPPLIES REQUIRED.

APPARATUS FOR GENERAL USE.

Stove.	Garbage can.
Scales.	Box of labels.
12 glass jars, pints and half pints.	Roll of paper.
1 quart measure.	Twine.
1 can opener.	Scissors.
1 potato slicer.	Dish towels.
1 wire potato masher.	Cheesecloth.
1 frying basket.	Paper towels.
2 to 6 kettles or stewpans.	Alcohol or oil for stoves.
1 double boiler, 1 quart.	Iodin.
1 double boiler, 2 quart.	Ether.
1 Dover egg beater.	Nitric acid.
1 wire egg beater.	Test tubes.
Food chopper.	Filter paper.
Vegetable cutters of different types.	Petrie dishes.
Chopping bowl and knife.	Thermometer.
Molds.	Sirup gauge.
Bean pot.	Microscope.
Pudding dishes.	Blackboard and chalk.
Colander.	Charts.
Fruit funnel.	Thumb tacks.
Dish pan.	

APPARATUS FOR INDIVIDUAL USE OF PUPILS.

As many of each article as there are pupils in the class.	
Measure cups.	Knife and fork.
Tin or agate pans.	Palette knife.
Tin or agate plates to cover pans.	Paring knife.
Earthen bowls, 1 quart each.	Saucepans.
Strainers to fit cup (fine).	Frying pans.
Strainers to fit bowl (coarser).	Graters.
Tablespoon.	Note books and pencils.
Teaspoons.	

SUPPLIES.

Whatever green vegetables are available, as mentioned in each lesson, or any canned vegetables that will aid in the lessons when fresh vegetables are not available. Also the following:

Dry beans and peas.	Rice.
Nuts.	Tapioca.
Peanut butter.	Cornstarch.
Potatoes.	Salt.
Squash seeds.	Pepper.
Olive oil, cottonseed oil, or other salad oil.	Spices, etc.
Vinegar.	Tea.
Flour.	Coffee.
Sugar.	Chocolate.
Butter.	Vanilla bean.
Cream.	Cream of tartar.
Milk.	Soda.
Eggs.	Soap.
	Sand soap.





